

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.]

[1912.]

XVII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW.—XIII.

G. MASSEE.

CHAETOMIUM.

The species enumerated have all, without exception, been studied from specimens that have appeared spontaneously on old cultures, in Petri dishes, &c., in the Jodrell Laboratory.

The members of the genus *Chaetomium*, owing to their fragility, do not make good herbarium specimens, and as the species are in a somewhat chaotic condition, advantage has been taken of the occurrence of living material to furnish amended diagnoses of the British species.

Chaetomium, Kunze, Myc. Heft, 1, p. 15 (1817); Zopf, Entwickel. d. Ascomyceten, p. 274 (1881); Sacc., Syll., 1, p. 220 (1882); Cooke, Hdbk. Brit. Fungi, 2, p. 652 (1871).

Perithecium superficial, varying form from subglobose to cylindrical, rigid, very fragile and breaking up when the spores are mature, dark brown or blackish, mouth small, papillate, pale, surrounded by a dense cluster of straight or variously curved, simple or branched, rigid setae, collectively constituting the crown-hairs. *Asci* clavate or sub-cylindrical, 8-spored, deliquescent at an early stage. *Paraphyses* absent. *Spores* 2-seriate or rarely 1-seriate, 1-celled, laterally compressed, varying from circular to broadly lemon-shaped in a front view, often apiculate, becoming dark coloured, usually blackish-olive.

The presence of hairs on the perithecium, in so many genera included in the *Sphaeriaceae*, reaches the maximum of development in *Chaetomium*, where the crown-hairs usually form a dense tuft much exceeding in size that of the perithecium. These hairs present great variety of structure and forms in different species, sometimes quite simple and straight, in others again slightly wavy or flexuous, or coiled into a long, cylindrical spiral, all the turns being in the same direction, or one half of the spiral turning from

right to left, the other half turning from left to right, with a short straight piece between the two opposite spirals, as in some tendrils. The crown-hairs are usually asperate, or roughened by minute particles of oxalate of lime.

The wall of the ascus deliquesces at an early stage, leaving the spores free in the perithecium, from which they are expelled at maturity by the swelling, under the influence of moisture, of the mucilage resulting from the deliquescence of the asci and cells composing the inner layers of the wall of the perithecium. When extruded from the ascus, the spores form a solid mass, surrounded by the crown-hairs, and are eventually dispersed by rain, &c.

The spores are lentil-shaped, or bi-convex, and often apiculate at one or both ends. Colourless at first, the epispore passes through various shades of green and olive, and eventually becomes brownish-olive, and usually quite opaque. The epispore is quite smooth in all known species.

Zopf has given an exhaustive account of the morphology of the various species of *Chaetomium* accompanied by very beautiful illustrations in *Entwicklungsgeschichte der Ascomyceten*; *Chaetomium*. Nova Acta der Ksl. Leop.-Carol. Deutschen Akademie der Naturforscher, Band xlii., no. 5.

KEY TO THE SPECIES.

Crown-hairs spirally coiled throughout their length—

All the crown-hairs spirally coiled *C. bostrychodes*.

Straight hairs mixed with others that are spirally coiled
... .. *C. crispatum*.

Crown-hairs straight or slightly wavy, circinate at the tip—

Spores 14–18 μ diam. *C. murorum*.

Spores 7–9 μ diam. *C. arachnoides*.

Crown-hairs with an interrupted spiral, turning alternately to left and right *C. simile*.

Crown-hairs slightly wavy throughout their length *C. Kunzeanum*.

Crown-hairs straight, branched—

Perithecium elongated, sub-cylindrical *C. comatum*.

Perithecium broadly elliptical or sub-globose *C. pannosum*.

Chaetomium bostrychodes, Zopf, *Entwickel. d. Ascomyceten*, p. 81, tab. 7, figs. 14–28 (1881); Sacc., *Syll.*, 1, p. 224 (1882).

Perithecium narrowly elliptical, or sometimes almost cylindrical, 320–350 μ high, 200–240 μ broad, brown; mouth small, papillate, almost colourless; crown-hairs rather stout, septate, slightly asperate, closely coiled into a long, cylindrical spiral up to the end, collectively forming a large, subglobose tuft; hairs on the body of the perithecium short, straight, sharp-pointed, blackish, at first spreading, then pointing upwards; rhizoids not very numerous. *Asci* clavate, 50–55 \times 11–14 μ . *Spores* irregularly 2-seriate, broadly elliptical, laterally compressed, smooth, olive-brown, 6–7.5 \times 5 μ . *Conidia* unknown.

HAB.—On decaying plant and animal remains, dung, &c. On blotting-paper in a Petri dish, Jodrell Laboratory, Kew.

Most closely allied to *C. spirale*, Zopf, which differs in its larger size, and lemon-shaped, larger spores.

Chaetomium crispatum, *Fuckel*, *Symb. Mycol.*, p. 90 (1871). *Sacc.*, *Syll.*, 1, p. 224 (1882); *Zopf*, *Entwickel. d. Ascomyceten*, p. 81, tab. 7, figs. 1-13 (1881).

Perithecium broadly elliptical, blackish-brown, 400-500 μ long, up to 350 μ broad, mouth small, papillate; crown-hairs of two kinds mixed together, some straight or very slightly waved, pointed, dark coloured, and often more or less asperate, others coiled into a spiral almost throughout their entire length, dark, stout, pointed, the whole forming a dark, olive-tinged head; hairs on the body of the perithecium, short, pointed, straight, dark-coloured. *Asci* cylindrical, averaging 100 \times 10 μ . *Spores* 1-seriate, broadly elliptical and minutely apiculate at each end, or sometimes almost globose, compressed, olive-brown, 12-14 \times 10 μ . *Conidia* unknown.

HAB.—On decaying potato tubers, on dung, &c. On old damp blotting-paper in a Petri dish, Jodrell Laboratory, Kew.

Readily recognised by the cylindrical ascus, 1-seriate spores, and the crown-hairs being of two forms. Most closely allied to *C. spirale*, *Zopf*, which differs in the broadly clavate ascus, and 2-seriate spores.

Chaetomium murorum, *Corda*, *Icon. Fung.*, 1, p. 24, fig. 293B (1837); *Sacc.*, *Syll.*, 1, p. 223 (1882); *Zopf*, *Entwickel. d. Ascomyceten*, p. 80, tab. 6, figs. 13-20 (1881); *Cooke*, *Hdbk. Brit. Fungi*, 2, p. 653 (1871).

Perithecium varying from broadly elliptical to subglobose, averaging 150-250 μ high, by 150-200 μ broad, blackish-brown, mouth minute, paler; crown-hairs cylindrical, dark coloured, thin, slightly wavy throughout their length, and with a small curl at the tip, often asperate, the whole forming a large, rather loose tuft; hairs on the body of the perithecium short, pointed, dark coloured, often asperate. *Asci* broadly clavate, shortly stalked, 80-100 \times 11-14 μ . *Spores* 2-seriate, elliptical, minutely apiculate at each end, dark brown, laterally compressed, 14-18 \times 8-9 μ . *Conidia* unknown.

HAB.—On old damp plaster, on dung, &c. On old rice paste in a Petri dish, Jodrell Laboratory, Kew.

Distinguished by the long, flexuous crown-hairs, with a small, close curl at the tip.

Chaetomium arachnoides, *Mass. & Salm.*, in *Ann. Bot.*, 16, p. 71, pl. 4, figs. 97-103 (1902); *Sacc.*, *Syll.*, 17, p. 600 (1905).

Perithecium small, subglobose, blackish, 200 μ high by about 180 μ broad; mouth small, papillate, pale; crown-hairs very long, slender, wavy, often circinate at the tip, 4-5 μ thick, smooth, dark coloured, collectively forming a large, widely spreading tuft; hairs on the body of the perithecium short, straight, pointed, dark coloured. *Asci* clavate, averaging 36 \times 12 μ . *Spores* irregularly 2-seriate, broadly elliptical or subglobose, laterally compressed, yellowish brown, 7-9 \times 5-6 μ . *Conidia* unknown.

HAB.—On sheep's dung, and on damp blotting-paper.

Readily distinguished by the very long, flexuous crown hairs, which are often fasciculate at the base, and more or less circinate at the tip.

Chaetomium simile, *Mass. & Salm.*, in *Ann. Bot.*, 16, p. 71, pl. 4, figs. 8-9 (1902); *Sacc.*, *Syll.*, 17, p. 600 (1905).

Perithecium subglobose, 50-75 μ broad, blackish-brown; mouth small, papillate, pale; crown-hairs brown, smooth, loosely and interruptedly spirally twisted, some coils from left to right, others in the opposite direction, tips often uncinatate, the whole forming a dense tuft of a dusky olive colour; hairs on the body of the perithecium short, straight, pointed, brownish. *Asci* cylindrical, 80-90 \times 10 μ . *Spores* obliquely 1-seriate, broadly elliptical or subglobose, compressed, one end minutely apiculate, the other end rounded, olive-brown, 8-10 \times 7.5 μ . *Conidia* unknown.

HAB.—On dogs' dung.

Most nearly allied to *C. crispatum*, Fuckel, which differs in having larger spores, apiculate at both ends, and in the crown-hairs being more closely spirally coiled throughout their length, and mixed with other hairs only slightly flexuous.

Chaetomium Kunzeanum, *Zopf*, *Entwickel. d. Ascomyceten*, p. 82, tabs. 1-3, tab. 4, figs. 1-13 (1881).

Perithecium broadly elliptical, dark brown, 300-350 μ high, about 250 μ broad; mouth papillate, pale; crown-hairs very long, wavy, sometimes with a curl at the tip, stout, dark brown sometimes olive or yellowish, asperate, collectively forming a large, dense tuft; hairs on the body of the perithecium stout, straight, pointed, dark coloured. *Asci* clavate, with a stem of variable length, averaging 100 \times 11 μ . *Spores* irregularly 2-seriate, broadly elliptical, laterally compressed, minutely apiculate at both ends, 11-14 \times 8-10 μ , olive-brown. *Conidia* are produced on the hyphae of germinating spores, similar to those described under *C. pannosum*.

SYN. *Chaetomium chartarum*, *Ehrb.*, *Sylv. Myc. Berol.*, p. 27 (1818); *Sacc.*, *Syll.*, 1, p. 223 (1882). *C. Fieberi*, *Corda*, *Icon. Fung.*, 1, p. 24, f. 293, c (1837); *Sacc.*, *Syll.*, 1, p. 223 (1882). *C. Fieberi*, var. *chlorina*, *Sacc.*, *Mich.*, 1, p. 27 (1877); *Sacc.*, *Syll.*, 1, p. 233 (1882). *C. chlorinum*, *Grove*, *Journ. Bot.*, 50, p. 47 (1912).

HAB. On damp paper, old cord, decaying vegetable matter, &c. On old damp blotting-paper in a Petri dish, Jodrell Laboratory, Kew.

A very variable species, the extreme forms of which, seen independently, have been mistaken for distinct species, but which, when an extensive collection is available, are found to be connected with each other by intermediate forms.

The colour of the hairs ranges from blackish-brown, through olive to yellow.

Chaetomium comatum, *Fries*, *Syst. Myc.* 3, p. 253 (1829); *Sacc.*, *Syll.* 1, p. 221 (1882); *Cooke*, *Hdbk. Brit. Fung.*, 2, p. 652 (1871).

Perithecium elongated, cylindric-ovate or sometimes inclined to cylindric-clavate, brown, length variable, 400-500 \times 150-250 μ broad, blackish-brown; mouth small, paler; crown-hairs elongated, straight, stout, blackish, often asperate, with short, pointed, spreading branches, the whole forming a dense, erect tuft; hairs on the body of the perithecium straight, unbranched, pointed, blackish,

ascending; rhizoids present. *Asci* clavate, shortly stalked $40-55 \times 14-16\mu$. *Spores* irregularly 2-seriate, broadly elliptical, laterally compressed, smooth, brown with an olive tinge, $10-13 \times 9-10\mu$.

According to Fuckel, *Sporodum conopleoides*, Corda, is the conidial form of this species. This suggestion however turns on the frequent contiguity of the two forms, and remains to be corroborated or otherwise, by pure cultures.

SYN. *Chaetomium elatum*, Kunze, Deutschl. Schwämme, No. 184 (1837); Zopf, Entwickel. d. Ascomyceten, p. 83 (1881). *C. Fieberi*, Fuckel, Symb. Myc. p. 90 (1869-70). *C. lageniforme*, Corda, Icon. Fung., p. 24, tab. 7, fig. 293A (1837). *C. atrum*, Tul., Sel. Fung. Carp., 2, p. 268 (1863). *C. funiculum*, Cooke, Grev. 1, p. 176 (1873); Sacc. Syll., 1, p. 226 (1882).

HAB. Frequent on damp straw and decaying vegetable matter of all kinds, also on dry dung. On damp blotting-paper in a Petri dish in the Jodrell Laboratory, Kew.

Distinguished by the elongated, narrowly elliptical perithecium, and the branched crown-hairs.

Chaetomium pannosum, Walbr., Flor. Crypt. Germ., 2, p. 267 (1831); Sacc., Syll., 1, p. 221 (1882); Zopf, Entwickel. d. Ascomyceten, p. 80, tab. 4, figs. 14-26. tab. 5, figs. 1-11 (1881).

Perithecium relatively large, broadly elliptical, blackish-brown, $400-500\mu$ high, 300μ broad; mouth papillate, pale; crown-hairs stout, dark brown, asperate, angularly bent and giving off stout, straight, pointed branches from the outer angles, the whole forming a large dense tuft; hairs on the body of the perithecium dark coloured, short, stout, pointed; rhizoids well developed. *Ascus* clavate, with a pedicel of variable length, $90-100 \times 17-21\mu$. *Spores* irregularly 2-seriate, elliptical, apiculate at each end, compressed, $10-15 \times 9-10\mu$, olive-brown.

According to Zopf, the spores of this species on germination form chains of minute globose conidia produced at the tips of short lateral branches. These chains collapse and form a spherical head involved in mucus, which remains attached for some time to the tip of the branch.

Chaetomium indicum, Corda, Icon. Fung., 4, p. 38, fig. 104 (1840); Sacc., Syll., 1, p. 222 (1882).

This species has been met with at Kew, on damp packing paper from India, but cannot be considered as a British species.

CERATOSTOMA AND MYXOTRICHUM.

Ceratostoma Notarisii, Sacc., Fung. Ven. Ser. ii., p. 308. This species is remarkable for the very long beak to the perithecium. It occurred abundantly on damp blotting-paper, and on damp cotton-wool, in Petri dishes in the Jodrell Laboratory.

Myxotrichum spinosum, Mass. and Salm. in Ann. Bot. xvi., p. 64. On decaying bark, in a Petri dish, Jodrell Laboratory.

DOUBTFUL SPECIES.

Chaetomium griseum, Cooke in Grev. 1, p. 175 (1873); Sacc., Syll. 1, p. 226 (1882).

Subgregarious or scattered, grey or cinereous, perithecium globose, brown, submembranaceous; hairs long, elastic, circinate, pellucid, faintly and very rarely septate. *Asci* clavate, fasciculate; sporidia lemon-shaped, colourless; endochrome granular, or nucleate.

HAB. On old sacking, King's Lynn (*C. B. Plowright*). On old rag and paper, Highgate (*M. C. Cooke*).

The threads somewhat resemble those of *Chaetomium murorum*, but are stouter, less rigid, and more transparent, the sporidia are larger and colourless ($\cdot 0004\text{--}\cdot 0006 \times \cdot 00025\text{--}\cdot 00035$ in.) = $\cdot 013\text{--}\cdot 017 \times \cdot 006\text{--}\cdot 009\mu$.

No type specimen exists, and judging from the above description, which is Cooke's original account of the fungus, the species is not likely to be recognised again. Furthermore, if the spores are colourless, the fungus cannot be a *Chaetomium*.

EXPLANATION OF PLATE.

Figs. 1-4; *Chaetomium crispatum*; 1, perithecium; 2, the two forms of crown-hairs; 3, ascus; 4, spores.

Fig. 5; *Chaetomium murorum*.

Figs. 6-8; *Chaetomium pannosum*; 6, perithecium; 7, tip of a crown-hair; 8, spores.

Figs. 9-10; *Chaetomium Kunzeanum*; 9, perithecium; 10, showing habit of fungus, nat. size.

Figs. 11-12; *Chaetomium comatum*; 11, perithecium; 12, ascus.

Fig. 13, *Chaetomium bostrychodes*.

Figs. 14-18; *Ceratostoma Notarisii*; 14, perithecium; 15, perithecium after the spores have been ejected from the perithecium and held in a mass by the crown-hairs; 16, mouth of perithecium with reduced crown-hairs; 17, ascus; 18, portion of crown-hair.

Figs. 19-20; *Myxotrichum spinosum*; 19, perithecium; 20, network covering perithecium.

Fig. 10, nat. size, the remainder magnified.

XVIII.—A VISIT TO THE WEST INDIES

An invitation was received from the Imperial Commissioner of Agriculture for the West Indies, at the end of October, 1911, for a Representative of the Royal Botanic Gardens, Kew, to attend the Eighth West Indian Agricultural Conference to be held at Trinidad in January, 1912. This invitation was accepted by the Director with the sanction of the President of the Board of Agriculture and Fisheries, and I was deputed to attend the Conference as the Representative of the Royal Botanic Gardens.

The passage to the West Indies was made with the other British Delegates* in the R.M.S.P. "Arcadian," leaving England on

* Mr. G. A. K. Marshall, Scientific Secretary, Entomological Research Committee, Colonial Office; Messrs. J. W. McConnell and W. Marsland, British Cotton Growing Association, and Messrs. C. Sandbach Parker and E. R. Davson, West India Committee.

January 3rd, 1912, and we were fortunate in having Professor Carmody, Director of Agriculture, Trinidad, as a passenger on board the boat. The return journey was in the R.M.S.P. "Trent," reaching Southampton on February 19th. Through the kindness of the Royal Mail Steamship Company free passages to and from the West Indies were accorded to the British Delegates. Nearly twenty-two days were thus available in the West Indies. Barbados was visited on the way out and again on the return journey; the week before the Conference I spent in a visit to Dominica and the islands lying between it and Trinidad and the week after the close of the Conference in a visit to Palmiste, the estate of Mr. Norman Lamont, and in camping out in the "High Woods" of Morne L'Enfer in the southern part of Trinidad.

Owing to the forethought and kindness of the Imperial Commissioner of Agriculture, President of the Conference; the Director of Agriculture and the local committee in Trinidad; the Director of the Local Department of Agriculture, Barbados, and the Agricultural Superintendents and Curators of Botanic Stations, and many others in the islands visited, my stay in the West Indies was rendered particularly pleasant and profitable. My best thanks are due to all those who spared themselves no trouble in enabling me to utilise the short time at my disposal to the greatest advantage. It was with much regret that, owing to the shortness of time at my disposal, I was unable to accept a pressing invitation to pay a visit to British Guiana.

BARBADOS.

We were met on arrival at Barbados by Dr. Watts, and later Mr. Bovell and Sir Frederick Clarke, President of the Agricultural Society, came to take us ashore. The day was spent under their kindly auspices, in visiting cotton ginneries and the offices and experimental grounds of the Local Department of Agriculture. On the return voyage Dr. Watts conducted us over the offices of the Imperial Department of Agriculture and afterwards through the kindness of Mr. Collymore, took us for a motor car drive of some forty-five miles around the southern and south-eastern end of the island in the course of which the sugar mill at Spencers was visited and a very interesting general idea of the island and its extensive cultivation was obtained.

Cotton.—There are two flourishing Cotton ginneries situated in Bridgetown, one with three gins belonging to Mr. Thornton and the other, the co-operative factory, where about a dozen gins were working. Cotton of very good quality was being ginned at both factories and the work was being done on similar lines in each place. The cleaned seeds were also dealt with and after being crushed and heated the mass was pressed to extract the oil. The resultant oil cakes contain some five per cent. of oil and are either sold as cake or ground into meal. The oil undergoes purification until a high class, pale yellow oil is obtained very similar to olive oil and used for similar purposes. Both the oil and the cake produced in the island are disposed of locally. In both factories the cleanliness and airiness of the ginning rooms was a striking feature. The

various processes connected with the cotton industry are of particular interest since there is not a particle of waste material left over in the factory.

At the co-operative factory I had the further interest of seeing the cotton being baled by a powerful hydraulic press and the sewing up of the bales and the binding with steel hoops.

Under the guidance of Mr. Bovell the Experiment Station of the Local Department of Agriculture was then visited and the various plots of sugars, cotton, yams, &c., were examined. Among the cottons a good variety found near a native hut was being used for selection purposes and we were also shewn some diminutive plants as well as some tall specimens the offspring of a self-fertilized hybrid. Large numbers of sugar cane seedlings in the nursery were also examined. The gardens in and around Bridgetown were gay with *Caesalpinia pulcherrima*, *Bougainvillea*, *Hibiscus*, &c., and at Mr. Bovell's house a *Beaumontia* was in full flower, as fine a sight as a great white Himalayan Rhododendron. The small proportion of uncultivated and uncultivable land in Barbados as well as the dense population are the remarkable features of the island. Tilled ground planted with sugar, cotton, maize, and Guinea grass, stretches away on all sides, and around the native huts appear small patches of other produce such as tania, yams, okras, cassava and papaws.

Sugar.—I was fortunate enough to see the commencement of the sugar manufacture and visited the mill at Spencers where sugar is made by the old Muscovado process. Many of the old mills in Barbados are still driven by wind power, but at Spencers the motive power is steam. The crushing mill which is hand fed is composed of a single pair of crushing rollers and the extracted juice is run off into the factory where it is limed, boiled and concentrated. The megass, that is the dry refuse cane from which the juice has been extracted, is laid out in the sun to dry and then used as fuel for the furnaces. In the boiling house the juice is evaporated in a series of open copper pans and kept stirred by negroes with perforated copper ladles on long handles, the thickening syrup being gradually ladled up from pan to pan and then at the right time run out in crystallising tanks. The sunlight streaming in on the bubbling golden-brown syrup in the burnished copper pans and lighting up the bronze negroes often stripped to the waist, with their long-handled ladles in constant motion produced a remarkably beautiful colour effect. The brown crystallised sticky mass consisting of sugar and molasses is then placed in a centrifugal machine which separates the molasses and leaves a beautiful finely crystalline cream-coloured sugar behind. This sugar which is quite dry is then bagged for export.

The pieces of sugar cane used for replanting the cane fields are taken from the tops of the old canes, a piece of stem about one to one and a half feet in length being cut off, which consists of several internodes. In the case of a long-cultivated variety such, for instance, as "White Transparent," it is often found in Barbados that no eyes or axillary buds are developed in the upper part of the cane or ratoon, and care has to be taken that such useless pieces are discarded before planting as no shoots can be developed from them.

The damage done by cane borers to the stools and roots of the canes was very marked in passing through the cane fields, both in the yellow colour of the leaves and the lack of vigour of the plants in fields badly attacked. It seems probable from specimens preserved in the offices of the Imperial Department of Agriculture that the beetle which is reported to be doing so much damage to sugar canes in Mauritius occurs in Barbados and may have been carried from the West Indies, but in Barbados apparently the damage which can be traced to its larvae is not very appreciable.

The sea coast of Barbados on the N.E. by Bathsheba is of considerable beauty and affords a striking contrast to the main mass of the densely cultivated portion of the Island.

THE WINDWARD ISLANDS AND DOMINICA.

On the outward journey Trinidad was reached on January 16th in the morning. The view of Trinidad and of the Bocas Islands with the outline of the Venezuelan mountains dimly seen through the early morning mist has often been described and is of remarkable beauty. The day was spent in Port of Spain where we were met on arrival by Mr. Freeman and in the course of the day I met most of the Officers of the Department and of the Board of Agriculture. After being very kindly received by His Excellency the Governor, I visited the Botanic Gardens with Dr. Watts, and later in the afternoon embarked on the R.M.S. "Balantia" for the Northern Islands. Owing to the kind arrangements made by Dr. Watts I was able to utilise the short time available in each island to the best advantage.

GRENADA.

Grenada was reached soon after six a.m. on Wednesday, January 17th, and Mr. Auchinleck took me across the bay in the Government cutter to the Botanic Garden. The situation of St. George's, with its almost circular harbour is one of the most beautiful in the West Indies. The Botanic Garden is a charming spot prettily laid out and contains many fine specimens of exotic trees and palms. Here, as elsewhere, in West Indian Botanic Gardens the visitor receives a shock to his ideas about geographical distribution until he realises that the native vegetable products are almost unrepresented and that the plants around him have largely come from the Tropics of the old world. Kew no doubt is largely answerable for this condition of affairs and though by her introduction of the finest products of the East she has certainly added enormously to the beauty of West Indian gardens, yet one cannot but feel that the neglect of the native vegetation is to be regretted.

An addition to the Grenada Botanic Garden in the shape of a rather dry and rocky promontory has recently been made which would form an ideal spot for a collection of the more xerophytic types of native and exotic vegetation; it is to be hoped that as full advantage of the possibilities will be taken as the circumstances permit. Not only is the garden a charming spot both by reason of its situation and the nature of its contents, but it also serves its purpose as a centre for the growing of economic plants for distribution. One small tree is kept as a home for scale insects and their

parasitic fungus, *Cephalosporium lecanii*, and the leaves are distributed over the island in order to spread the fungus which has resulted in keeping the *Lecanium* scale in check.

Useful work is being done in connection with the peasant agriculture by giving instruction in the country and by the establishment of small experimental plots as object lessons in different parts of the island. In this way it is hoped, not without reason, to raise the standard of the cultivation of the peasants' small holdings which are a very important feature of the conditions which prevail in Grenada. Ten thousand, three hundred acres are in the hands of peasant proprietors holding ten acres or less while 64,200 acres are held in estates or holdings of over ten acres.

ST. VINCENT.

Owing to the lateness of the hour at which the steamer arrived at St. Vincent on the outward journey and the early arrival and short stay on the return voyage, I was unfortunately unable to get ashore to visit the Botanic Station. The noble bay, with its forest-clad mountains and Georgetown half hidden among the trees and palms forms a view of great beauty from the steamer.

In St. Vincent the cotton industry is being conducted by Government on successful lines. The Government owns the Central Ginnery and purchases the cotton from the peasants, and the work is largely in the hands of the Agricultural Superintendent. In addition to this work and the care of the Botanic Station, there is the advisory work connected with the estates which entails a considerable amount of travelling about the island.

Here, as elsewhere, in the West Indies the multiplicity and diversity of the work which devolves upon the agricultural superintendents or curators strikes the visitor with surprise which is increased when it is seen how efficiently the various duties are performed.

ST. LUCIA.

St. Lucia was reached in the early morning and we berthed alongside for coaling. Castries being an important coaling station, has its beauty somewhat marred in consequence and the comparatively high wages which can be obtained from coaling operations render the natives indolent in agricultural matters. Here we were met by Dr. L. Nicholls and taken across a piece of low-lying ground to the Botanic Station which is partly situated on a reclaimed swamp at the end of the harbour. The situation is by no means a good one, but the gardens have risen superior to the site and possess several attractive features. Soon after my arrival I was met by Mr. Moore, who took me all over the station. The garden contains a good and interesting collection of exotic plants and a good nursery stock of economic plants for distribution. The nutmegs in full fruit, just bursting and exposing the crimson mace were among some of the most beautiful objects in the garden. The garden affords a fine spot on one side for a collection of West Indian ferns, but the funds at the disposal of the station are insufficient to allow of expenditure on the formation of collections of purely botanical interest.

Before rejoining the steamer a visit was paid to the market where a fair collection of native vegetables was displayed for sale, but owing to the time of year few fruits were being offered.

Lack of time unfortunately prevented a visit to Union where Mr. Brooks is in charge of the experiment station of some ten to fifteen acres in extent. The cultivation in the island is mainly in the hands of small peasant proprietors whom it is found difficult to rouse to any great energy.

On the return journey we arrived at Castries after dark and in the rain, so that no more could be seen of the island, and it was unfortunate that the famous Pitons of St. Lucia were not visible owing to our passing them at night both on the northward and southward voyages.

MARTINIQUE.

We passed sufficiently close to the northern end of Martinique to examine with the aid of glasses the condition of St. Pierre and the slopes of Mt. Pelee which had been swept by the eruption of 1902. The contrast between the appearance in 1903 when I landed near St. Pierre and went all over the site of the town and the condition of the spot in January last was very striking. The site of the town is now covered with vegetation, some plants being of a considerable height, and the slopes of the mountain itself are almost equally green. The deep cañon-like gorges cut by the water courses through the consolidated volcanic ash, however, are clearly visible with their barren grey cliffs and there are some delta-like patches of grey ash, probably washed down by the torrents, which were equally barren. Already some houses have been erected on the old site and the remains of the cathedral appeared to have been restored.

The changes brought about by time are doubtless quite comparable to those which have taken place on the Soufriere of St. Vincent recently described by Sands.*

DOMINICA.

The view of Dominica from the sea rising in lofty forest-clad mountains and cut by deep valleys is probably as grand a sight as the West Indies can afford, and the nearer approach only serves to heighten the beauty of the Island. Along the shores of the little bays or river mouths are groves of cocoanuts partly screening the native huts from view, while on the hill-sides the planters' houses with attendant royal palms are situated charmingly, and here and there a Bois Immortelle stands out as a patch of blazing colour in striking contrast to the many shaded greens of the dense forest. At Roseau I was met by Mr. J. Jones, Curator of the Botanic Station, and the Assistant Curator, Mr. G. A. Jones, and went at once to the Botanic Station situated at the back of the town.

The Dominica Station, with its stretches of vivid green turf of *Paspalum dilatatum*, studded with handsome well-grown specimens of trees of all kinds and with the forest-clad cliff of the Morne as a background, is undoubtedly the finest botanic garden in the West

* W. Ind. Bull., vol. xii, No. 1, 1912, pp. 22-33.

Indian Islands. It has a remarkable air of spaciousness, for the specimens are not crowded and a great deal of the charm of the spot depends on this as well as on the artistic manner in which the general arrangements have been made. The time of year was not very favourable for trees in flower and except for the mortelles which were alive with humming birds and for a small tree of the West African *Baikiea insignis*, with its striking white flowers, there was very little in the way of floral display. The experimental plots are conveniently placed along the valley, and as they are screened by a hedge do not interfere with the landscape effects of the garden.

Cacao.—The Cacao-grafting experiments, which have been carried out with such success by Mr. Jones, were of particular interest. The trees as yet are young but I was particularly struck by their low growing and spreading habit in contrast to the more fastigate character of the bushes raised from seed. The grafted plant is produced from a lateral branch scion and may be compared in its growth form to a broad-based cone standing on its base, while the seedling resembles rather a cone standing on its apex. The grafted tree would appear to offer several advantages over the seedling, though it is sometimes asserted that we are not yet in a position fully to realise the value of grafting. (1) It makes it possible to have a plantation devoted to one variety of Cacao alone. This is a matter of considerable value since uniformity in the beans brought in for curing could be secured and a uniform product should result. At present, owing to the mixed crop comprising beans of different varieties, a good deal of difficulty is experienced in adjusting the time of fermentation and regulating the drying and curing processes, and as a consequence uniformity of the sample is often lost. (2) By using different varieties for grafting it would be possible to arrange a succession of plots ripening at different times and also the crop time might be slightly lengthened. (3) The habit of growth of the plant tends to shade the ground and so to prevent loss of water by evaporation. It would appear as far as can be seen that the picking of the pods would be a much easier process than it is in the case of the higher branches of the tall trees grown from seedlings, and that therefore injury from bad picking should be reduced to a minimum.

The question of "shade" or "no shade" for Cacao does not appear to be so burning a question as in Trinidad, nor does it seem safe to dogmatise for one island from experiences gained in another when conditions of climate and soil vary so much. But in any case it would be rash for a mere visitor to enter with hastily gleaned impressions into a field where veterans may have fought and fallen.

Some interesting hybridising experiments with Cacao were also in progress at the Botanic Station, and I saw sixteen plants of what appeared undoubtedly to be the result of an artificial cross between the Alligator Cacao, *Theobroma pentagona*, which has large beans, and a hardy variety of Forastero, *T. Cacao*. The experiment may lead to results of considerable scientific and economic importance, as it is hoped that by selection on Mendelian lines a useful variety may result. The value of mulch for Cacao and other crops was also well demonstrated in the experimental plots.

Cacao is grown up to about 1500 ft. on the sides of the valley and the plantations contain all types of Calabash and Forastero. The value of mulch for the health and vigour of the trees is constantly advocated by the officers of the station, and its effect in the island is well marked though on the steep hill-sides the application of dressings is by no means an easy matter. Clean weeding of plantations on the steep hill-sides is a great mistake since the undergrowth tends to retain the surface soil from being denuded, and on being mown over provides material for mulching the Cacao.

Much might be said of the various activities displayed at the Botanic Station. Space will only allow passing mention of the training of boys which is here carried out in a very efficient manner. Only a small number sufficient to meet the demand for overseers, etc., on estates are taken and they receive a sound practical and theoretical training.

Thanks to the kindness of Mr. G. A. Jones, who accompanied me, I was able to see as much as possible of the natural vegetation of the island by riding up to the heads of two of the beautiful valleys near Roseau. The luxuriance of the vegetation and its diversity are particularly striking, as well as the fact that the flora of each valley appears to be distinct in many important features. The tree ferns, twenty feet or more high, lend a peculiar charm to the scene in the higher parts of the valley, and one's pleasure was increased on finding *Utricularia montana* in flower on the banks at the top of the col.

A very good general idea of the western side of the island was obtained on the voyage to Portsmouth in the R.M.S.P. coasting steamer "Yare," which I made in company with Mr. J. Jones and Dr. H. Alford Nicholls. The steamer keeps so close in that the flora can easily be studied through field glasses and the xerophytic vegetation of the cliffs with *Furcraeas*, *Mamillarias* and species of *Cereus* as well as the components of the forest-clad hills can easily be distinguished and species in many cases identified. Some brown savannah-like areas are in striking contrast to the densely forested hills and are no doubt due, as Dr. Nicholls has pointed out, to the wanton destruction of forest and repeated burning which has led to extensive denudation of the soil. Portsmouth at the northern end of the island has a good harbour, which, however, is exposed to the south-west, and will no doubt gradually become a place of importance. At present it is not a healthy spot owing to extensive lagoons and swampy ground behind the town through which the Indian River runs. Since the bar at the mouth of the river has been removed and a properly arranged breakwater constructed, by the Dominica Forests Company which is exploiting the forests, conditions have been improved and a lowering of the water-level in the lagoons to the extent of about a foot has resulted.

Forests.—The forests on the hills near the town are now being worked for timber and a considerable trade in lumber is in progress. Unfortunately I was unable to visit the forests, but according to the "Memorandum on the Crown Lands in Dominica" presented by Mr. J. Jones to the Conference, and from what I was told in the Island, it is considered that the Crown has made all necessary reservations in connection with the rights

over 12,500 acres of forest land which have been recently granted to the Dominica Forests Company. River banks and watersheds are properly reserved and there are also large areas of the steep mountain sides impossible for plantations, but there is no Forest Officer in the island and we are in great measure ignorant of the trees composing the forests. It would seem therefore to be a matter of prime importance that the forests should be examined by a fully qualified officer and that regulations should be laid down as to the type and number of trees that may be cut and as to the proper age for cutting. Reserves also should be made, it would appear, not so much on general principles but rather in accordance with the character of the country on the results of a botanical survey, for it must be realised by anyone familiar with the island that its economic welfare is largely bound up with the proper conservation of the forests.

Our knowledge of the flora of Dominica is far from perfect, and as regards the trees we have perhaps more to learn than of any other type of vegetation. The information we do possess of the forest trees and of the value of their timbers is largely due to the efforts of Dr. Nicholls and Mr. Jones, but it is to be hoped that it may not be long before the flora and fauna of the island are carefully studied, a task which would be arduous, owing to the many mountains and numerous steep valleys, but would certainly yield results of great scientific interest.

Limes.—The principal industries of Dominica are the growing of Limes and Cacao. Rubber is being planted on estates in some parts of the island and there is a certain amount of cultivation in coffee, sugar, vanilla and minor products. The Lime industry appears to be in a flourishing condition and trees were very free from scale and blight largely owing to good cultivation. The lime juice is extracted and concentrated in the island before exportation. Before the limes are carted to the factory the oil is expressed from the rind by hand, and it is a common sight to see negro women sitting by the side of the path with an *Iquelle*, a small copper vessel like a cullender, at their side in which the lime is rubbed with the hand until all the oil is pressed out. The oil is collected into a vessel and the limes are at once taken to the factory. It is somewhat remarkable that no machine has been invented for extracting the oil, but the varying size of the fruits no doubt presents considerable difficulties. The women are able to deal with an enormous number of limes per day.

Owing to the difficult nature of the country and the loose volcanic rock of which much of the island consists and the heavy rainfall, the making of roads is a difficult task, and except on the flat land near Roseau there are no roads for wheeled traffic. Bridle paths leading through scenes of great beauty wind up the valleys and connect villages and estates, but transport is in consequence difficult and costly. Much land in the centre of the island, though suitable for cultivation, cannot be taken up owing to the lack of proper means of communication.

Museum.—At Roseau I was very kindly received by the Administrator and was taken by him to see the recently formed Museum, the success of which is largely owing to his great personal interest. The Museum had only been open to inspection for about three months, and the collections were necessarily small though very interesting in

character. Both in quality and arrangement they reflect the greatest credit on Dr. Nicholls, Mr. Agar and Mr. Jones, who are primarily responsible for the foundation of the Museum. Dr. Nicholls has lent his collection of Carib stone implements, which is probably unique in its size and variety, Mr. Agar has collected and arranged a large number of entomological specimens which should form the nucleus of an important collection, and the botanical exhibits are due to the activities of Mr. Jones.

Such a voluntary effort as the formation of this Museum deserves every encouragement, for there can be no doubt that as the collections increase and are accurately determined the value of the Museum to the community will be inestimable.

It was with many regrets that I had to turn my back on Dominica, which offers so stimulating a field to the naturalist owing to our comparative ignorance of its fauna and flora and which in addition possesses tropical scenery of such singular beauty.

TRINIDAD.

The Agricultural Conference.

Trinidad was reached in the early morning of January 23rd from the Northern Islands by the R.M.S. "Balantia," with a goodly company on board bound for the Conference. Kew was well represented by the Agricultural Superintendents, Curators of Botanic Stations, and Agricultural Instructors from the various islands. Soon after coming to anchor off Port of Spain we were met by the Colonial Secretary, the Hon. S. W. Knaggs, Mr. Freeman, Assistant Director of Agriculture, and Mr. Tripp, Secretary of the Agricultural Society, representing the local Reception Committee, and taken ashore in the launch, picking up the Delegates from British Guiana and Barbados from their respective ships on our way.

The Conference was declared open at 1.30 in a speech of welcome from His Excellency the Governor, Sir George R. Le Hunte, G.C.M.G. The President then delivered his address, and was followed by Professor Carmody, who gave an account of agricultural progress in Trinidad and Tobago. A Reception at Government House by His Excellency and evening lectures completed the first day's work.

As the Proceedings of the Conference will be published in full in the West Indian Bulletin, I do not propose to give any detailed account of the papers and discussions. Our time was well arranged, and a great deal of work of a very interesting character was done during the week that the Conference was sitting.

Early morning demonstrations from 7.30 to 8.30 at the St. Clair experiment station formed some of the most interesting and useful features of the Conference. Mr. Guppy demonstrated his methods of trapping Cacao beetles by using pieces of branches of the wild chataigne, *Fachira aquatica*, a tree which is very attractive to the beetles, and he pointed out the danger of growing it near a Cacao plantation. Then followed a demonstration by Mr. Rorer on the spraying of Cacao, showing the value of different types of nozzle; suitable forms of apparatus for use on hilly plantations were also

exhibited. Demonstrations of tapping of *Hevea* and *Castilloa* were given by Mr. Collens and Mr. Evans, and methods of coagulating the latex and smoking the rubber were also explained. This demonstration was of particular interest in connection with a very able lecture on Rubber Cultivation delivered by Dr. Cramer, Director of Agriculture, Surinam, whose presence at the Conference as representative of Surinam was highly appreciated. Dr. Cramer drew upon his wide experience of rubber cultivation in Java and spoke strongly against the policy of clean weeding except in very exceptional situations. The necessity of a covering to the ground on hillside plantations was forcibly insisted upon, as also the necessity of liberal mulching, and there can be no doubt from what I was able to see of Cacao plantations in Dominica and Trinidad that the same remarks undoubtedly hold good in the case of Cacao.

The subjects for discussion at the Conference were allocated to special days or half days, Cacao, Cotton, Sugar and Rubber being among the most important and interesting. There was not always sufficient time to exhaust the subject under discussion as the number of papers presented to the Conference was very large.

A suggestion was brought forward that the Conference might be broken up into sections dealing with different products, but the plan would seem hardly advisable since the majority of the delegates are interested in all or almost all the subjects brought up for discussion, and it is essential that those who have to advise on agricultural matters in the various Colonies should keep themselves in touch with the latest views on the various subjects which are embraced under agriculture. It would no doubt be possible to relegate the more purely scientific questions relating to Mycology, Entomology and Chemistry to subsections of experts as was done to some extent at this Conference, and it might also be considered desirable to remove papers concerning agricultural education from the programme of the whole Congress. But as the matter is receiving the careful consideration of the Imperial Commissioner it would be out of place for me to dwell on the subject at greater length.

Cacao.—The discussion on Cacao turned chiefly on the fungoid and insect diseases to which this crop is subject. Mr. Rorer demonstrated that both the pod rot and stem canker of Cacao is due to *Phytophthora Faberi* in a convincing manner with the help of a beautiful series of photographs and living specimens in which he showed the disease passing back into the stem through the stalk of the diseased pod. The value of spraying as a control of both insect and fungus attacks was also strongly advocated. Mr. Guppy dealt especially with the insect attacks and Mr. South presented a useful paper in which, among other things, he cleared up the somewhat involved nomenclature of the various fungoid pests.

The value of grafted Cacao was also discussed and the general feeling appeared to be that the experiments had not yet been seen on a sufficiently large scale or for a sufficiently long time for their merits to be properly appreciated. This feeling may possibly be due to the fact that the Dominica plots had been seen by only a few of the members of the Conference. In the course of the discussion I was glad to have the opportunity of expressing the very favourable opinion I had formed of the value of Mr. Jones'

work with grafted Cacao and pointed out the advantages which might be anticipated from the adoption of this method on a large scale. (See p. 172.)

Professor Harrison exhibited a series of beautifully executed water-colour drawings by Miss van Nooten of the pods of the different varieties of Cacao from trees cultivated by the Department of Science and Agriculture, British Guiana, which are to be presented to the Royal Botanic Gardens, Kew, and will form a valuable addition to the standard collection of illustrations of the different types of Cacao in cultivation.

Some interesting Cacao pods of the Forastero type were shown at the Agricultural Show by Mr. R. S. Reid of King's Bay, Tobago, and have since been presented by him to Kew. They were obtained from plants raised from the seeds of trees over 200 years old still growing in Tobago which were probably planted by Dutch settlers. Mr. Reid writes of the finding of the trees as follows :

"In 1906 I went with a native as guide up the Louis D'or River (two miles from King's Bay, Tobago), for about three miles and then scrambled up a tributary ravine until the 'Woods Cacao' (as the natives call it), was reached. There were about a dozen trees in a clump, surrounded by forest trees, from 50 to 100 feet in height and the Cacao trees appeared like huge palms with a crest of branches at the top. Seeds had dropped and the young seedlings were like fishing rods from 40 to 50 feet long, bare but for a few leaves on top. A few pods were on the trees—perhaps three on each at most. As they were not ripe, I sent a native a couple of months later to gather them and he brought down five pods. Three of these were sent to the late Mr. I. G. Haynes, St. Clair Avenue, and from bamboo cups he transplanted a number of the plants in his garden and it was from these trees that the pods on the Tobago Planters' Association Stand at the Exhibition, were gathered."

During the Conference week I visited the Government River Estate with Professor Carmody, Dr. Watts and others, and went through the extensive Cacao plantations.

Experiments are being conducted as to the value of "Shade" and "No shade," and in some cases the treatment seems rather drastic as the Immortelles, which had been planted fairly thickly and had formed a regular canopy over the Cacao, had all been removed at once with the result that in such cases the bushes had suffered to a considerable extent. Gradual removal of shade does not seem to be attended with harmful results, and if lines of these trees could be left at frequent intervals to act as wind breaks it might be found that the rest of the shade could be dispensed with to advantage.

On Lord Glenconner's estate at Ortinola which I had the good fortune to visit under the guidance of Mr. W. J. Bain, I noticed comparatively little shade, but such shade trees as were grown were lopped freely for mulch. A free growing leguminous tree without prickles on the stem would be the most useful kind of tree for the purpose of affording partial shade as well as for providing mulch. The River Estate plantations are mainly on flat or gently

sloping land, but at Ortinola much of the land is on steep hillsides. The value of mulching was thoroughly appreciated both at River Estate and Ortinola, but its importance on the latter plantation was particularly noticeable.

The cultivation at Ortinola was very good and the general health and fruiting of the trees was in striking contrast to those on the adjoining estate. Mulches of all kinds, such as *Heliconias*, grasses, branches of shade trees, etc., were freely used and the effect on the soil was most noticeable. Under the mulch it was soft and friable with the Cacao roots pushing up into it, while at the sides of the drains it was a stiff clay. The important part played by earthworms in these tropic soils is very marked and their value was fully recognised.

Clean weeding is not practised, but on the other hand a covering of weeds, ferns *Tradescantias*, etc., is encouraged especially on the steep slopes, and such weeds are mown over from time to time. The Cacao hulls are limed and covered over with leaves and in course of time also serve as manure. The crop at Ortinola was a remarkably fine one and few sights of the kind are more beautiful than that presented by an extensive view in a Cacao plantation where the stems and branches are thickly covered with the rich crimson or golden-yellow pods, where the eye gets lost among the maze of laden stems and branches stretching away beneath the canopy of foliage.

Another question which exercises the minds of Cacao planters is that of "chupons," whether one, two, several or none should be allowed to grow. The "chupon" is a strong shoot such as we welcome in a rose tree for instance, and may spring from below the ground or from the main stem or from a branch. At River Estate there are plots occupied by fairly old trees where one, two, three or more chupons are being allowed to grow and a plot where all chupons are removed is also kept under observation. The results will be published in course of time, but from what could be seen at the Government plantations, Ortinola and elsewhere, it would appear that no hard and fast rule can be laid down on the subject and that the condition of each individual tree must be taken into consideration before deciding whether it may be necessary to encourage the growth of one or more chupons and as to which should be allowed to grow to the best advantage. In the case of an old tree whose stem has largely lost the power of producing flower buds, it is obviously sound policy to encourage the vigorous "chupon" and in course of time to allow it to replace the parent tree entirely. Similarly the "chupon" may be encouraged where it is necessary to replace a broken branch or to fill up the leaf canopy of the tree.

The fermentation, drying and polishing of the Cacao was also seen at River Estate; the latter process is delightfully primitive, being effected by the coolies and negroes who dance on the beans with bare feet in the blazing sun on the top of the drying sheds. A certain amount of clay is mixed with the beans before the dancing commences and the polishing, which cannot apparently be done by machinery, tends to preserve the beans and also enhances their value on the market. By some claying is not considered

necessary, but by others its value for the preservation of the beans is held to be all important. The polishing process takes from ten to twenty minutes. Owing to the different varieties of Cacao in Trinidad both of Calabash, Forastero and Criollo, which may be growing in the same plantation, a very mixed sample of beans may be brought in and this adds considerably to the difficulties of properly regulating the fermentation and may often result in spoiling somewhat the grade of the product. Plantations true to type would be of immense benefit to the industry, but except by grafting such an end does not appear to be possible.

Sugar.—This proved to be an inexhaustible subject of discussion, such well-worn topics as the value of seedling canes over the Bourbon and White Transparent varieties receiving their due share of attention. The possibility of making experiments on Mendelian lines with Sugar cane was raised by Mr. South, who presented a paper on "The application of Mendelian Principles to Sugar cane breeding," but the suggestion was considered impracticable by many of the delegates. So little is known at present as to the essential botanical characters* of the various types of cane or of the probability of such types breeding true that it is clear that much time must elapse before any tangible results can be obtained. Under present conditions it is not easy to see where such work could be done or what officers could find the time to conduct a series of arduous experiments, but nevertheless both as regards Sugar and Cotton it would seem highly desirable that Mendelian experiments should be started on a proper basis. An experimental station would have to be established and equipped with duly qualified officers, who should be allowed to pursue their investigations and researches without the distractions of advisory and routine work and without fear of constant interruption from members of the commercial community eager for results.

At present, therefore, the methods of selection now in operation must be continued though no fixity of type can be assured. Nowhere are such experiments being conducted with greater care than in British Guiana, and the work of the Agricultural Department in that Colony is deserving of the highest praise.

A series of beautiful water-colour drawings by Miss van Nooten of the different types of Sugar cane cultivated by the Department of Science and Agriculture, British Guiana, was exhibited by Professor Harrison in illustration of his remarks on Sugar cane problems. The drawings are of great practical use and would prove of considerable value in any work which might be undertaken in the future as a record of varietal characters.

Mr. Urich dealt with the various insect pests and pointed to the need of co-operation between Demerara and the Islands, with regard to investigations in connection with the encouragement of natural enemies and the application of remedial measures, a

* In a paper presented to the Conference Mr. Sahasrabudde put forward the view, as the result of his investigations, that the different types of axillary buds offered a useful character for classifying sugar cane varieties, but the hypothesis did not appear to be sufficiently well proved though it may be found eventually to be capable of application.

suggestion which is equally applicable to questions affecting diseases due to Fungi, and one from which if adopted excellent results may be anticipated in the future.

Sugar is still the dominant crop of Trinidad, Demerara and Barbados, and there has been a very large expenditure in the remodelling of factories and in their equipment with the latest types of machinery, but on some estates at least it would appear that greater attention should be given to the improvement of the actual cultivation of the canes and to questions of crop rotation. These most important matters are occupying the serious attention of the Agricultural Departments and nowhere more so than in British Guiana, and I gathered, were beginning to receive due consideration on some of the large estates around San Fernando in Trinidad.

When staying with Mr. Norman Lamont at Palmiste during the week after the Conference, I paid a visit with him to the Usine St. Madeleine, a very large factory fitted with all the latest machinery for the manufacture of sugar. Unfortunately it was not in working order, but under the guidance of the engineer I made a thorough examination of the various machines and apparatus connected with the making of the sugar and also for the distilling of rum.

On the following day Mr. Lamont kindly took me to see the smaller factory of Malgré Toute, near Prince's Town, and I was able to follow the whole process of manufacture by modern machinery which afforded considerable contrast to the Muscovado process seen in Barbados. Here oil fuel was being used in addition to megass and the use of petroleum will no doubt increase largely in the course of a few years. The megass will then tend to become a product, for which there will be no use in the factory, and already it is being used near Port of Spain for making a good tough brown paper, and it may also be found profitable to return it to the land as manure. Though the season was later than usual owing to the absence of rain I was fortunate in being able to see the harvesting of the cane, the preparation of sets for replanting and the most approved process of sugar manufacture.

Cotton.—The present position and possible improvements in the Cotton industry provided an interesting morning's discussion, especially as the representatives of the British Cotton Growing Association were present and expressed their views. Mr. McConnell had spent most of the previous week in St. Vincent and was therefore able to bring his expert knowledge to bear on the problems affecting the Cotton industry in the West Indies. He mentioned that there had never before been a fine cotton so strongly grown as that now being produced in the West Indies, but he also pointed out that it was essential that the staple should be regular.

Nep or weak places in the cotton apparently due to weakness of fibre is common in West Indian Cotton and is a serious defect which lowers its value. In selecting cottons attention should be devoted to eliminating those with weak fibres. In the course of the discussion it was brought out that the condition of the lint depended to some extent on cultivation and that the proper development of the cotton was largely a factor of nutrition. In cotton generally there is a tendency for the lint to be collected at one end of the seed rather

than to be evenly distributed, and it would appear that in those types in which a dense apical development of cotton obtains a greater proportion of weak lint results. This may probably be due to the crowding of the fibres preventing the possibility of many of the hair cells receiving their proper share of food and allowing only a certain proportion to attain their full development. A possible remedy for such a condition of affairs would appear to be to select cottons showing the greatest tendency to a uniform distribution of the lint over the whole surface of the seed, and Mr. Bovell stated that in Barbados this point received particular attention.

A great deal of careful work is being done in the attempt to produce better and more stable varieties, and the work of Mr. Thornton of Tobago is deserving of very high praise. It seems possible that in course of time it may be found that West Indian Cotton is amenable to treatment on Mendelian principles as the work of Leake and Balls tends to prove is the case for the Indian and Egyptian varieties. Here again there is the need for ascertaining the exact botanical characters of the numerous varieties and of establishing as soon as may be a definite collection of types for purposes of reference. At present though much useful work has been accomplished the selection of cotton is largely empirical, the parentage of the hybrids is usually unknown, crossing with indifferent native types is liable to take place and there is thus always a tendency to deterioration. Cotton breeding work, to be of permanent value, would appear to require a station set apart where it could be carried on to completion without fear of disturbance.

An important and interesting paper on the Cotton boll weevil of Mexico and the United States was read by Mr. Ballou, and the gradual spread of this pest eastward was graphically demonstrated. As only some 450 miles of country remained in 1910 between its present most easterly station and the Atlantic the possibility of its introduction into the West Indies is becoming a grave one. Precautionary measures were advocated, and it was pointed out that provided it does not invade the islands West Indian Cotton is likely to benefit by its spread in the United States owing to the reduction that will take place in the yield of Sea Island Cotton.

Papers were also read by Mr. Sands in which an account was given of the careful manner in which the Cotton industry is being fostered in St. Vincent, by Mr. Tenpany on the Cotton industry in the Leeward Islands, and by Mr. Robson on Cotton selection in Montserrat.

Rubber. Rubber formed the subject of an early morning demonstration at St. Clair, and also occupied the attention of the Conference during a morning's sitting. The delegates had the opportunity of hearing the views of Mr. Pearson, Editor of the "Rubber World," on the subject, and also of Dr. Cramer, whose evening lecture on Rubber Cultivation, illustrated by a magnificent series of slides, was very highly appreciated. Para, Ceara, *Castilloa* and *Funtumia* rubbers have been planted in the Islands and in British Guiana, but according to the general consensus of opinion Para rubber is the only one likely to prove of commercial importance. The Central American *Castilloa*, though it grows vigorously, offers very serious difficulties in tapping, and there is great uncertainty

as to the actual species in cultivation and as to their capacities for yielding latex. Moreover, the tree tends to be a harbinger of scale and blight, and as Mr. Pearson puts it, "it is the most provoking weed that was ever sprung upon mankind."

Funtumia elastica has been largely planted in Trinidad and I met with several plantations in the South of the Island, but it seems doubtful whether it will yield results commensurate with the expectations that have been formed of its value. When planted far apart as I saw it on one estate the young plants were growing like coffee bushes. Close planting produces trees with more definite stems, and it may be that it is as yet too early to form a proper opinion as to the future of this plant in the West Indies.

With Para rubber the West Indies have to labour under the difficulty of importing seed from the East without definite knowledge as to the character and latex-producing powers of the trees from which they have been obtained. There is thus always a danger that trees which yield seeds quickly may not be the best latex producers. Two old trees of true *Hevea brasiliensis* have recently been discovered in a wild portion of the Trinidad Botanic Gardens, and careful experiments as to the latex production of these trees and of other undoubted Para rubber trees in the experimental plots are being made so that before long the island will possess accurate data as to the yield of its own trees from which a supply of seeds will be available.

Despite the somewhat low rainfall of Trinidad, which in the past year was considerably below the average, Para rubber appears to flourish, and I saw some promising young trees on one of Mr. Lamont's plantations at Palmiste. Ceara rubber and the other Manihot rubbers find but little favour in the West Indies, and it seems that the rubber industry generally will always be pursued under more difficult conditions than in the East owing to the lack of cheap labour and the difficulty of obtaining experienced tappers.

Cocoanuts.—The Coconut industry is rapidly rising in importance as an object of agricultural activity in the West Indies owing to the good prices which are being realised for nuts and copra. Flourishing plantations exist on the windward side of Trinidad, and others are being established at various places around the coast. At present the demand for nuts for planting is far in excess of the supply.

The diseases of Cocoanuts due to insects and fungi occupied the attention of the Conference. The Bud-rot disease described by Mr. Rorer is a serious parasitic disease of bacterial origin and is prevalent in Trinidad, and great care is being taken to destroy all trees affected by the disease. Mr. Urich dealt with the numerous insect pests, the most serious being the beetles which bore into the stems. Insects no doubt also aid in the dissemination of the Bud-rot fungus. Manurial experiments with Cocoanuts have been started under the control of the Board of Agriculture in Trinidad and Tobago but no results have yet been published.

An account was also given by Messrs. Tempany & Jackson of the experimental planting of Cocoanuts in Antigua, from which we learnt with pleasure that a fair measure of success is anticipated as this crop would form welcome minor industry in the Island.

An object of particular interest which was shown at the Conference by Professor Harrison was the first fruit of the *Coco-de-mer* of the Seychelles which has ripened on the young plants in the Botanic Gardens at Georgetown, Demerara,* raised by Mr. Waby.

Other industries to which the attention of the Congress was directed were as follows :—

Limes, which are a staple industry in Dominica and are now becoming a crop of importance in Antigua.

Sweet Potatoes.—This product formed the subject of a useful paper by Mr. Robson in which he dealt with the attempts he has made to classify the varieties of sweet potatoes in Montserrat. The paper was illustrated by a large number of specimens illustrating the different characters of foliage and tuber on which the classification is based.

Bay Rum.—The bay rum and bay oil industries of St. Thomas and St. Jan were described by Mr. Fishlock, and it was suggested that there might be an opening for a moderate trade in bay oil and dry leaves of the best quality from the English Islands to St. Thomas.

Mycology and Entomology. A committee was appointed consisting of the scientific officers in the various colonies with Mr. Marshall and myself as members under the Chairmanship of Mr. Marshall to consider questions relating to difficulties connected with the nomenclature and identification of fungus and insect pests. It was suggested that intercourse between the workers in the different colonies should be fostered by correspondence and that specimens should be exchanged in order that agreement may be reached as to their proper scientific and popular names. Also that in the case of Fungi specimens should be deposited at Kew and references of any difficulties should be made to that institution. The Entomological Research Committee to be the referee for insects. It was further suggested that facilities should be given for the scientific officers of the various Agricultural Departments to meet informally in one or other of the Colonies, and that if possible such meetings should take place annually. By meetings of this kind and by the interchange of specimens it was considered that the interests of scientific work would be furthered and that the spirit of co-operation thus encouraged would lead to greater efficiency and usefulness in the Agricultural Departments of the different Colonies. Moreover, such co-operation should tend to prevent unnecessary overlapping in mycological and entomological investigations.

An afternoon session was also devoted to the discussion of matters relating to Agricultural Education, but as this account does not profess to be exhaustive I must perforce refrain from dealing with so wide a subject and also from referring to many other matters of interest which were brought before the Conference.

FORESTRY IN TRINIDAD.

Although Forestry questions were brought to the notice of the Conference on the last morning, I deal with the subject apart from

* See *Kew Bulletin*, 1910. p. 256.

the Conference as, besides listening to the interesting paper by Mr. Rogers, the Forest Officer of Trinidad, he most kindly took me to see his experimental plantation at Arima and also to spend two nights in the Forest Reserve of Morne L'Enfer in the southern hills.

Mr. Rogers is working in Trinidad with only native foremen and overseers ; but for the carrying out of plantation work and forest conservation on an adequate scale, there is need of an enlargement of the European staff.

On the visit to Arima we were accompanied by Mr. Waby, Head Gardener of the Botanic Garden, Georgetown, Demerara, and much appreciated his wide knowledge of the flora. Here as elsewhere in Trinidad, Cedar (*Cedrela odorata*, L.), Cyp (*Cordia Gerascanthus*, Jacq.), Honduras Mahogany (*Swietenia macrophylla*, King), and Poui (*Tecoma serratifolia*, Don), are the trees most extensively planted.

Great care is being taken in the matter of seed selection, and the seed of only those trees which show a clean, straight trunk without tendency to forking and low branching is used for plantation work. The young trees I saw in the plantations bore out the wisdom of this policy, as they were in all cases forming vigorous clean main stems.

Before planting the forest is cleared of useless timber and the young trees are placed in lines twenty feet apart. The secondary growth is allowed to spring up between the lines, the young trees being kept clear. This treatment encourages their proper development and also the damage from pests and fungi is minimised. The trees at Arima were either sown at stake or planted from nursery beds, but in both cases the percentage of success was very high.

The visit to the forest of Morne L'Enfer was particularly interesting and it was entirely owing to the kindness of Mr. Rogers, who altered all his plans, that I was able to spend my last days in the Island in the heart of the forest. My best thanks are also due to Mr. Collignon, who was felling Cedar and Balata in the forest, beneath whose elegant "Ajoupa" we had our quarters.

Our way to the forest led across the famous Pitch Lake, so well described by Kingsley. A remarkable amount of vegetation comprising Cashew bushes, ferns and herbaceous plants appears to be growing actually on the surface of the pitch, but is doubtless rooted into soil which has collected in the cracks and fissures which occur over the surface of the asphalt. These islands of vegetation appear in strange contrast to the black waste of pitch. Owing to the discovery of oil in the heart of the forest a good cart track has been cut into the Morne L'Enfer Reserve, and we were able to drive to Mr. Collignon's Ajoupa in its very midst.

Here we found a beautifully constructed shelter roofed with the fan leaves of the Carat or Sabal Palm. The roof had a wide span and we slung our three hammocks beneath its protecting shelter in the greatest comfort. To add to the enjoyment of the experience there was a full moon and the scene in the forest at dead of night with the beams of brilliant moonlight here and there piercing the dense canopy overhead and lighting up the trunk of some great palm or illuminating the depths of the forest was one not easily to

be forgotten. Mr. Rogers was busily engaged in measuring the felled and squared logs of the fragrant Cedar (*Cedrela odorata*). These trees are distributed on an average of about three to every two acres; usually they have a clean trunk some 60 feet high with great flange buttresses at the base springing from the trunk about ten feet above the ground level. The trees are felled with axes and are cut down just above the tops of the buttresses. The trunk is cut into logs which are squared in the forest and then dragged out by oxen and sent by water to Port of Spain. The squaring of the logs is done entirely by hand with axes, and there is a sad waste of wood, not only in the unfelled buttressed portion and upper part of the trunk, which is considered too small in diameter to carry out of the forest, but also in the wasteful process of squaring the logs. Moreover, the trunks often crack with the violence of their fall and the wood tends to split badly owing to the lack of seasoning. It is difficult to understand why the logs should not be dragged out in the round, but apparently questions of transport and other matters render it impracticable. The Balata trees are being felled for railway sleepers.

From the tops of the felled trees I was able to bring home a fair collection of orchids, but as only Cedar and Balata trees were being felled I found that I had soon exhausted their epiphytic flora and it was only when some other kind of tree was brought down in the general wreck that I could add new species to my collection. A fine plant of *Vanilla*, climbing to a height of 40 feet up the trunk of a forest tree, with huge leaves and a stem of almost an inch in diameter, was noticed. Among the most beautiful objects in the forest were the Manáques (*Euterpes*) with their slender trunks some 60 feet high and graceful crowns of leaves. Other palms were abundant, such as *Attalea* loaded with Aroids, the Black Roseau (*Bactris*) with its long evil spines, the Carat (*Sabal*), and in damp places the Timite (*Manicaria*) with its seeds closely resembling those of the vegetable ivory palm. Other beautiful objects were the Browneas in full flower like a gleam of flame in the somewhat dim light of the forest, and the scarlet bracts of *Warscewiczia coccinea*, which almost equalled the Browneas in glory though they were far less common. Young seedling Cedars were met with occasionally in the forest, but middle-aged trees were rare.

In the Morne L'Enfer Reserve, though a great deal of felling has taken place, there has been no attempt made to plant up the clearings, and the forest is rapidly becoming of less value as a source of timber. It would not be possible, however, for fresh schemes of planting to be undertaken without an increase in the Forestry staff. But it would appear to be sound policy to plant up cleared areas with useful trees such as Cedar, and so to maintain the forest as a source of revenue to the Island.

Among other Forestry enterprises which deserve mention are the Mahogany plantations at River Estate and elsewhere in Trinidad. The species planted is usually *Swietenia macrophylla*, but there appear to be two distinct species grown in the Island in addition to the native small-leaved West Indian variety. One of these with leaves intermediate in size between those of the other two species may possibly be an undescribed form.

Logwood is also grown in the Island, and I saw Mr. Lamont's flourishing plantation near Palmiste which was a particularly beautiful sight at the time of my visit as many of the trees were in full flower and the air was laden with their scent.

ENTERTAINMENTS AND EXCURSIONS.

The Conference by way of properly adjusting the balance between business and pleasure, and also of giving opportunities for that social intercourse among its widely-separated members which is one of its most important functions, indulged in several festive entertainments and excursions. Most of them, however, were combined with opportunities for practical instruction and observation.

His Excellency the Governor most kindly entertained the Delegates at a Reception at Government House and also to dinner.

The Conference dinner was held on the Saturday evening and was honoured by His Excellency's presence. It was a great function and was attended by the members of the Reception Committee and others in Port of Spain who had done so much to make our visit a success. In the course of the speeches the thanks of the Delegates for all the kindness shown to them in Trinidad were suitably expressed.

The excursion to the River Estate has already been mentioned under the subject of Cacao. Arrangements were made to drive us to the Estate and from point to point, so that as much as possible might be seen, and on the return journey we were most kindly entertained to tea at the Boys' Reformatory, where we were received by His Lordship the Bishop of Trinidad, and afterwards shown over the Institution. The boys were all being taught useful trades connected with agricultural pursuits and were doing good work, and the whole of the arrangements of the Institution appeared admirable. On the same day other visits were paid to places of interest near Port of Spain under equally pleasant conditions.

Professor Carmody entertained the Delegates at Government Farm on the Saturday afternoon and an opportunity was thus afforded of seeing the Government stock and the various experiments in progress.

One excursion, however, was unique in character and has no parallel in the history of these Conferences. By the invitation of the Hon. Thomas Cochrane we were enabled to visit the Trinidad Oil Fields at Port Fortin, Guapo, and to see something of the great possibilities which may be realised by Trinidad as an oil producing country. His Excellency the Governor was of the party, and we made our journey to the south end of the Island in the R.M.S. "Balantia" which had been chartered by our generous host. On coming to anchor we were landed in small boats and proceeded to the wells partly on foot and only partly by the Company's gaily decorated railway trucks, owing to certain small accidents which fortunately had no untoward results. The day was most instructive and interesting as affording an idea of the great natural resources of Trinidad in the way of oil; but to the botanist and lover of things beautiful the tall derricks, often black and slimy with oil, rising among the wreck of tropical forest, the ground in many places covered with black petroleum, and the shanties, machine sheds and

railway lines suggested the very abomination of desolation standing in the place where it ought not.

As one walks in the forest near these oil wells, and also in the Morne L'Enfer Reserve, dome-like masses of pitch may be met with, and black oily matter may be seen oozing gently from small fissures among the shales in the heart of the forest.

It is clear that Trinidad possesses a vast source of mineral wealth in this southern region, which, provided it can be economically worked, will prove of immense value to the Colony and to our other West Indian possessions whose fuel at present is imported coal.

THE AGRICULTURAL SHOW.

At the conclusion of the Conference interest in agricultural affairs was maintained by the Agricultural Show held in Port of Spain under the auspices of the Agricultural Society, which was opened by His Excellency the Governor. The Society generously presented all the Delegates with free passes and invited them to a special private view of the show, a privilege of which they gladly availed themselves. I can only allude here to the remarkably fine exhibits of Cacao from Trinidad and Tobago, to the interesting collection of Citrus fruits of all varieties shown by the Agricultural Department, and to the numerous exhibits of native fruits and vegetables. Mr. Caracciolo had a stall of economic plants and showed methods of packing. There was also an exhibit of Silkworms, and from the flourishing condition of the caterpillars and the excellence of the silk it would appear that there is no reason on cultural grounds why this industry should not successfully be established in the West Indies.

The horticultural side of the show was disappointing and a fine plant of *Coryanthes* in flower was the most interesting exhibit.

THE BOTANIC GARDENS.

The Botanic Gardens of Port of Spain are so well known and their beauties have been so often described that it is not necessary to refer to them in any detail.

The collection of trees and shrubs contains a great number of interesting specimens and is especially rich in plants of economic importance. There are also many trees and shrubs of purely botanical or horticultural interest and two trees of *Amherstia* and a very fine *Camoensia*, which were in full flower at the time of the Conference, deserve special mention, as do also the collections of Palms and Bamboos.

The situation and natural features of the Gardens are delightful embracing as they do both hillside and valley with much uncultivated ground intersected by winding paths. A lack of spaciousness and landscape effect is noticeable in certain parts which prevents many of the fine trees from being seen to their full advantage. Of these defects Mr. Freeman is fully cognisant and before long no doubt considerable improvement will be effected.

The Experiment Station at St. Clair close by, which is also controlled by the Department of Agriculture, is well stocked with

economic plants in experimental plots, and much useful work is being done not only in the way of testing different varieties, but also in providing plants for distribution.

In the grounds of the Station is situated the building containing the Trinidad Herbarium, in which the late Mr. Hart took so keen an interest; and in the upper rooms the officers of the Board of Agriculture have their not very spacious headquarters.

CONCLUSION.

The account in the foregoing pages of Botanical and Agricultural enterprise in some of the West Indian Islands is of necessity but an impressionist sketch, the result of a hasty visit. Nevertheless, I venture to think that the impression of sound and useful work which I gained and which I have attempted to depict is a perfectly accurate one.

My sketch, however, would be sadly imperfect did I omit to refer more particularly to the work of the Imperial Department of Agriculture. The centralisation of the small local departments so successfully achieved by Sir Daniel Morris has been the means of helping forward very materially the general prosperity of the smaller islands, and the continuation of the work of the Department under Dr. Watts has been marked with equal success.

The Imperial Department has been the means of stimulating with helpful suggestions the lines of experiment suitable for the several islands and has also been able to procure materials and provide information which it would not have been in the power of the separate organisations to obtain. Some of the West Indian Colonies have found themselves strong enough and rich enough to be able to maintain independent Agricultural Departments, but they are at the same time in a position to avail themselves of the work done by the officers of the Imperial Department, just as the latter is ready and eager to make the best use of the researches undertaken by those Departments outside its immediate control.

In such a region as the West Indies where the problems awaiting solution are common to all it is clear that the only sure way to progress is by a federation of scientific interests, not necessarily by means of tangible bonds or definite agreements, but by a cordial spirit of mutual co-operation and friendly intercourse. Such a spirit it would seem can be best fostered by the opportunities for the exchange of ideas and the free and friendly discussion of difficulties which are afforded by the Agricultural Conferences.

Finally, I must, "as in private duty bound," allude to one matter which struck me very forcibly. In most of the islands the Agricultural Officers have been sent out from Kew, after serving their term of two or three years as young gardeners, to take up their respective duties. In a few cases the officers have not been trained at Kew, but my remarks apply equally to the good work they also are doing. The work which has fallen to the hands of all these officers is of the most varied character, and frequently of a type of which they have had no previous experience. I found them acting as buyers and sellers of cotton for Government, as teachers in agricultural schools, curators of gardens, devisers of experiments,

agricultural instructors, &c., besides which they are expected to have an expert knowledge of Botany, Forestry and many other subjects. In some islands most of the above functions appear to be centred in one and the same individual, and it was a matter of considerable satisfaction to find that they were fulfilling their various occupations with great credit to themselves and to the no small advantage of their respective communities. It would be invidious to refer to special cases, but it seemed to me that the valuable services of the Agricultural Officers were not always properly realised by their respective Governments.

The relationship which has so long existed between Kew and the West Indies has been a very happy one, and now that I have had the opportunity of seeing something of the excellent work which is being done by our men, I can only conclude by expressing the hope that the West Indies may continue to avail themselves of the help which Kew is always ready to render.

A. W. HILL.

XIX.—FUNGI EXOTICI : XIII.

Of the eight new Fungi here described, two are considered to be injurious parasites. *Pheangella Heveae* is found on the bark of young Hevea rubber trees in S. Nigeria; and *Colletotrichum necator*, received from Mr. Ridley from Singapore, is said to cause the fruit of pepper to become blackened and shrivelled.

Of the other species three have been received from Mr. F. Manson Bailey, Brisbane, and one each from India, Trinidad, and Java.

BASIDIOMYCETES.

Lepiota aurea, *Massee*.

Pileus carnosulus, e convexo-campanulato explanato-depressus, interdum subumbonatus, aureus, dein decoloratus et in squamulas fuscidulas eleganter excoriatus, siccus, circa 2 cm. latus. *Lamellae* liberae, postice angustatae, ex albo luteolae. *Stipes* subaequalis, fistulosus, fibrillosus, pileo concolor, 4–5 cm. longus, 2 mm. crassus, annulus tomentosus, mox evanidus. *Sporae* ellipsoideae, hyalinae, $7 \times 4\mu$.

QUEENSLAND. On manured ground. *C. T. White*. The specimen was sent by Mr. F. M. Bailey, accompanied by a coloured figure.

Galera delicatula, *Massee*.

Pileus tenerrimus, e convexo expansus usque planus, margine subrepando, cinnamomeus, primo fibrilloso-villosus, postea squamulis concoloribus adpressis vestitus, siccus, 1–2 cm. latus. *Lamellae* confertae, angustae, adnexae, e pallido cinnamomeo-fulventes, acie albido-pruinosa. *Stipes* fistulosus, cylindraceus, glaber, pileo concolor, 4–5 cm. longus, 2 mm. crassus. *Sporae* ellipsoideae, utrinque obtusae, cinnamomae, $15\text{--}16 \times 7\mu$.

INDIA. District of Dacca: Experimental Farm, in grass, *Burkill*, 34,928.

Allied to *Galera vinolenta*, Berk., which differs in the vinous colour of the pileus, and the much smaller spores.

ASCOMYCETES.

Eutypa gigaspora, *Massee*.

Stroma latissime effusum, innatum, dein superficiale, scabrum, extus intusque atrum. *Perithecia* majuscula, ostiolo papillato. *Asci* cylindracei, brevissime pedicellati, $200 \times 12\mu$, octospori. *Sporae* oblique monostichae, elongato-ellipsoideae, rectae vel plus minusve curvulae, hyalinae, $30-32 \times 8-9\mu$.

TRINIDAD. On dead wood, *H. Caracciolo*.

Allied to *Eutypa erumpens*, Mass., but distinguished by the much larger spores.

Hypospila Eucalypti, *Wakefield*.

Maculae amphigenae, brunneo-rufae, circa 4 mm. diametro. *Perithecia* nigra, irregulariter concentrice disposita, parenchymati folii immersa, epidermide bullatim inflata oblecta. *Asci* ellipsoidei, apice subacuto, incrassato, brevissime pedicellati, $80-85 \times 25-28\mu$, octospori. *Sporae* tristichae, cylindraceae, utrinque obtusae, leniter curvulae, guttulae, dein 1-septatae, $45-50 \times 5\mu$.

Adest status conidiiferus; *receptacula* ut *perithecia*, *conidia* hyalina, elliptica, $5-7 \times 1-1.5\mu$.

QUEENSLAND. Darra: on leaves of *Eucalyptus*, *C. T. White*. Received through Mr. F. M. Bailey.

Pheangella Heveae, *Massee*.

Ascomata erumpente-superficialia, basi crassa substipitata, caespitosa vel seriatim disposita, ex urceolata patellato, coriacea, sordide ochracea, 1 mm. diametro. *Asci* elongato-clavati, octospori, $65 \times 9-10\mu$, paraphysibus obvallati. *Sporae* distichae, oblongo-ellipticae, utrinque rotundatae, uniseptatae, ad septa non constrictae, hyalinae, $11-12 \times 6\mu$.

S. NIGERIA. On bark of *Hevea*, *Johnson*.

Considered an injurious parasite on the bark of young trees.

DEUTEROMYCETES.

Gloeosporium Tristaniae, *Massee*.

Acervuli innato-erumpentes, convexuli, sparsi vel aggregati, pallidi, 0.5-1.5 mm. lati, epidermide lacerata cincti. *Conidia* ellipsoidea, hyalina subinde 2-guttulata, $6-9 \times 2-3\mu$. *Basidia* filiformia, hyalina, $6-8\mu$ longa.

QUEENSLAND. Virginia Creek: on leaves of *Tristania laurina*, R. Br., *C. T. White*. Received through Mr. F. M. Bailey.

Distinguished from all known species by the small size and the form of the conidia.

Colletotrichum necator, *Massee*.

Maculae minutae, pallescentes. *Acervuli* laxi gregarii, orbiculares, mox erumpentes, $200-250\mu$ diametro. *Conidia* hyalina, subcylindracea, utrinque obtusa, $20-23 \times 5-7\mu$, sterigmatibus cylindraceis vel sursum attenuatis hyalinis $40-50 \times 5\mu$ suffulta. *Setulae* paucae, rigidae, cylindraceo-attenuatae, septatae, $100-130 \times 4-6\mu$, fuligineae.

SINGAPORE. On fruit of pepper, *Ridley*.

Said to cause the fruit to become blackened and shrivelled.

Distinguished by its habit, and by the few hairs present intermixed with the spores.

Excipula nigro-cincta, *Massee*.

Perithecia innato-erumpentia, cupulata, subcoriacea, glabra, pallida, nigro-marginata, circa 300μ diametro. *Conidia* continua, hyalina, ellipsoidea, $30-35 \times 10-12\mu$.

JAVA. On leaves of *Hoya*, *F. W. Moore*.

Distinguished from all known species by the pallid disk, surrounded by a black margin.

XX.—DIAGNOSES AFRICANAE : XLVII.

1331. *Argomuellera sessilifolia*, *Prain* [Euphorbiaceae-Crotonae]; species ab *A. macrophylla*, Pax, foliis glabris sessilibus basi rotundatis facillime distinguenda.

Frutex vel *arbor* parva, ramulis fusco-pubescentibus. *Folia* sessilia, chartacea, oblanceolato-oblonga, obtuse acuminata apice mucronulata, a quadrante summo versus basin angustam rotundatam attenuata, margine minute remote denticulata, utrinque glabra, 35 cm. longa, 7.5-9 cm. lata; stipulae fusco-pubescentes, lanceolatae, 1.2-1.8 cm. longae. *Racemi* ex axillis superioribus plures, 15-22 cm. longi, rhachide gracili pubescente; bractae patentes, ovatae, acutae; flores glomerulati, glomerulis flores masculos plures femineum solitario centalem includentibus. ♂ *Sepala* 4 vel 3, erecta, ovato-lanceolata, 3 mm. longa. *Stamina* plurima; filamenta glandulis interstaminalibus apice hirsutis consociata. ♀ *Sepala* 6, rarius 5, distincte 2-seriata, interiora angustiora, ovata, acuta. *Ovarium* 3-loculare, pubescens; styli recurvi, superne intus longitrorsum stigmatici, basi connati. *Capsula* subglobosa, plus minusve 3-sulca, in coccis 2-valves dissiliens, extra pubescens, 8 mm. lata. *Semina* globosa, cinerea, maculis brunneis notata, 4 mm. lata.

TROPICAL AFRICA. Lower Guinea: Gaboon; Ogowé, *Thollon*, 741.

1332. *Crotonogyne strigosa*, *Prain* [Euphorbiaceae-Crotonae]; species *C. Poggei*, Pax, et *C. impeditae*, Prain, quam maxime affinis; ab illa corolla maris margine subintegra nec distincte 5-loba staminibusque paucioribus, ab hac glandulis extrastaminalibus discretis, corollaeque tubo intus glabro, ab ambabus indumento strigoso magnopere discrepat.

Frutex, ubique plus minusve pilis rigidiusculis patentibus strigosus. *Folia* alterna, sparsa, breve petiolata, membranacea, obovata vel oblanceolato-oblonga, apice longiuscule acuminata a triente summo gradatim deorsum angustata, ipso basi anguste rotundata vel truncata, eglandulosa, margine integra, parce strigosa, 17-30 cm. longa, 6-10 cm. lata, saturate viridia, utrinque secus nervos parce strigosa; petiolus 6-10 mm. longus, dense strigosus; stipulae anguste lanceolato-oblongae, 2 cm. longae, extra dense strigosae. *Racemi* 15-25 cm. longi, simplices; rhachides dense strigosae; flores masculi glomerati, glomeruli pauciflori; feminei solitarii, pauci, versus apicem rhachidis; pedicelli masculi brevissimi, feminei demum 6-8 mm. longi, dense strigosi; bractae extra dense strigosae. *Calyx* maris globosus, extra dense breviter pubescens, in alabastro clausus, demum valvatim 3-lobus, 2 mm. latus. *Corolla* alba, gamopetala, calyce longior, tubo campanulato, intus glabro,

limbo integro vel minopere undulato. *Stamina* circiter 10, exteriore 4, glandulis extrastaminalibus globosis glabris contiguus sed discretis circumcincta. *Calyx* feminei anguste ovoideus, extra dense strigosus, 5 mm. longus; lobi 5, anguste lanceolati, acuti, eglandulosi. *Petala* 5, alba, orbicularia, imbricata, calycis lobis breviora. *Discus* urceolatus. *Ovarium* dense strigosum; styli 3, singuli 2-partiti. *Capsula* dense strigosa, 8 mm. longa, in coccos 2-valves dissiliens.

TROPICAL AFRICA. Lower Guinea: Southern Nigeria; Oban district, Talbot, 658 and 659 (Herb. Brit. Mus.).

1333. *Micrococca scariosa*, Prain [Euphorbiaceae-Crotoneae]; species nulli inter congeneres arcte affinis, bracteis rigidis bracteolisque maris plurimis scariosis pedicellos articulos involventibus insignis, ideoque certissime saltem pro typo sectionis adhuc haud cognitae habenda.

Frutex dioicus, 1-2-metralis, valde ramosus, ramis ramulisque glabris, cortice brunneo lenticellato. *Folia* alterna, breve petiolata, chartacea, ovato-oblonga, acuta vel breve acuminata, margine crenato-dentata vel subintegra, basi rotundata ibique minute 2-glandulosa, 7-13 cm. longa, 3-6.5 cm. lata; pallide viridia, utrinque glabra, penninervia, nervis utrinsecus 5-6 arcuatim ascendentibus prope marginem anastomosantibus subtus distincte elevatis; petiolus 2-8 mm. longus, glaber, subcylindricus sed supra anguste canaliculatus; stipulae subulatae, 5 mm. longae, glabrae, caducae. *Spicae* rigidiusculae; rhachides 5-15 cm. longae, distincte interruptae, subtrigonae, virides, glabrae, laterales, oppositifoliae vel infra folia secus ramos ramulosque orientes, maris fasciculatae, feminei singulae; bractae lanceolatae, rigidae, inter se 2-6 mm. distantes, 2-3 mm. longae; bracteolae maris scariosae, obtusae, plurimae, 1 mm. longae, feminei rigidae, lineares, binae, 1.5 mm. longae; pedicelli articulati, maris 2 mm. longi, dimidio infra articulationem complanato angulis acutis sub lente ciliolatis, dimidio supra articulationem terete glabro, feminei demum 4 mm. longi. *Flores* maris glomerati singillatim tamen evoluti citoque decidui partem pedicelli inferiorem tantum relinquentes; feminei solitarii. ♂ *Calyx* ovoideo-globosus, albus, vix 1 mm. latus, valvatis 2-3-partitus. *Stamina* 21-24, receptaculo parum elevato inserta, glandulis juxta-staminalibus inter se liberis glabris vel apice parce pilosis totum receptaculum tegentibus immixta; filamenta libera, glabra; antherae 2-locellatae; locelli basifixi primum erecti, deinde divaricati, praeter basin inter se liberi, longitudinaliter dehiscentes. *Ovarii rudimentum* 0. ♀ *Sepala* 5, ovata, acuta, margine sub lente ciliolata, ceterum glabra, imbricata. *Discus* hypogynus e glandulis 6 (an semper 6?) oblongis contiguus sed inter se liberis compositus. *Ovarium* 3-loculare, glabrum; style 3, a basi liberi, subreflexi, ut videtur apice tantum fimbriati; ovula in quoque loculo solitaria. *Capsula* (singula tantum visa) 3-cocca, crustacea, primum septicide dissiliens.

TROPICAL AFRICA. German East Africa: Monyouni, Sacleux, 1630 (Aug. 1891); Amboni forest, near Tanga, Sacleux, 1630 (1897).

We have only been able to examine the analysis of a single female flower, and have only seen a single fruit; the latter, however, already shows the commencement of septicidal dehiscence without any trace of the loculicidal opening which probably ultimately

takes place. The true character of the stigma is not perfectly clear. Except for the peculiar glomeruli of scarious bracts in the male inflorescence, the characters of this plant are, however, clearly those of a *Micrococca*, to which genus it may for the moment be most conveniently referred. But the peculiar nature of the male glomeruli renders it necessary to recognise it as the type of a distinct section within that genus.

1334. *Pycncoma Thollonii*, *Prain* [Euphorbiaceae-Crotonae]; species quoad folia *P. macrophyllam*, Benth., simulans sed ab ea bracteis planis nec concavis, reflexis nec adscendentibus, spathulato-trapeziformibus manifeste differt.

Frutex ramulis gracilioribus duriusculis. *Folia* chartacea, glaberrima, viridia, obovato-oblongeolata, acuta vel acuminata, a triente summo versus basin anguste rotundatam attenuata, margine indistincte undulata, 25–38 cm. long, 10 cm. lata, sessilia. *Flores* racemosi, racemi ad ramulorum apices axillares, rhachi 6–8 cm. longa minute puberula; bractee 6 mm. longae, spathulato-trapeziformes, planae, reflexae, apice minutissime 3-lobulatae, margine minute ciliatae ceterum extra intusque glabrae; pedicelli graciles, puberuli, 1.25 cm. longi, sub quaque bractea 1–3. *Sepala* maris 3, ovato-triangularia, acuta, extra parce puberula vel glabra. *Stamina* plurima; filamenta gracilia, 1.25 cm. longa. *Sepala* feminei 5, ovato-lanceolata, acuta, extra glabrescentia vel glabra. *Ovarium* 3-loculare, pubescens; loculi singuli, dorso 2-cornuti; styli 3, parce hirsuti, basi breviter connati.

TROPICAL AFRICA. Lower Guinea; French Congo; Ogowé, *Thollon*, 842.

1335. *Tragia* (*Tagira*) *polygonoides*, *Prain* [Euphorbiaceae-Crotonae]; species *T. spathulatae*, Benth., quam maxime affinis, foliis fere glabris, calycis feminei segmentis angustioribus satis differt.

Herba; caules elongati, graciles, volubiles, glabri. *Folia* distincte vel longe petiolata, membranacea, ovato-oblonga vel ovato-oblongeolata, apice obtuse acuminata, mucronulata, basi distincte cordata, margine subintegra, nervis supra parce setosis subtus parcissime puberulis ceterum glabra, 6.5–10 cm. longa, 2–3 cm. lata; petioli parce puberuli, 0.7–4 cm. longi; stipulae ovatae, acutae, erectae, 4–5 mm. longae, minute puberulae vel glabrae. *Racemi* laterales, graciles, densi, 6–8 mm. longi, pedunculo nudo gracile pubescente 0.8–1.2 cm. longo suffulti, flores masculos plures versus apicem femineosque 1–2 basales gerentes; pedicelli sub quaque bractea singuli, bracteisque breviores; bractee maris ovatae, acutae, 2–4 mm. longae, glabrae; bractee feminei orbiculares, acute 3-lobae, bracteolae feminei ovatae, acutae. ♂ *Sepala* 3, ovata, apice pilis perpaucis induta. *Stamina* 3, filamenta brevissima. ♀ *Sepala* 6, ambitu anguste oblonga, subacuta, membranacea, hirsutissima, 8 mm. longa, in stipitem latum marginibus parcius hirsutum angustata. *Ovarium* parcius hispidum; styli 3, minute pubescentes, basi in columnam connati quadrante summo liberi. *Capsula* ignota.

TROPICAL AFRICA. Upper Guinea: Ivory Coast; Bonroukrou, *Chevalier*, 16,860.

Very nearly allied to *T. spathulata*, Benth., with which it agrees in having the female calyx-lobes quite entire but from which it differs in having them much smaller and narrower and in having nearly glabrous leaves.

1336. *Tragia* (*Tagira*) *anomala*, *Prain* [Euphorbiaceae-Crotonaceae]; species *T. ambigua*, S. Moore, proxima, a qua differt foliis praeter nervos pilis setosis obsitos glabris stylisque more *Sphaerostylis Tulasneanae*, Baill., in massam globosam 3-sulcam ovarium primum aequantem vel paulo superantem connatis.

Herba: caules elongati, graciles, volubiles, pilis urentibus armati. *Folia* distincte petiolata, membranacea, oblonga, acuta, basi distincte cordata sinu angustato, margine crebre crenata vel dentata, supra secus nervos parce setosa, subtus secus nervos densius pilis urentibus armata, ceterum glabra, 8-15 cm. longa, 3-6 cm. lata; petioli glabri vel glabrescentes, 2-4.5 cm. longi; stipulae lineari-lanceolatae, reflexae, 5-6 mm. longae, extra parce pubescentes. *Racemi* laterales, graciles, laxiusculi, 3-4 cm. longi, pedunculo nudo gracile minute puberulo 1.2-2.5 cm. longo suffulti, flores masculos plures versus apicem femineosque 1-2 basales gerentes; pedicelli subquaque bractea singuli, maris 5-6 mm. longi, minute puberuli, bracteas excedentes; bracteae maris oblongo-subspathulatae, obtusae vel subacutae, 2-4 mm. longae, membranaceae, extra puberulae; bracteae feminei oblanceolatae-oblongae, acutae, margine utrinsecus 2-3-dentatae nec lobatae; bracteolae feminei bracteis similes nisi minores. ♂ *Sepala* 3, late ovata, extra parce puberula. *Stamina* 3; filamenta brevissima; antherae introrsae. ♀ *Sepala* 6, ambitu ovato-lanceolata, primum membranacea, demum accrescentia vix tamen coriacea, 1 cm. longa, pinnatim utrinsecus 7-9-lobulata, lobuli laterales rhachideoque dense lanati pilis longissimis; laminula terminalis anguste ovata, fere glabra, lobulis lateralibus paullo major. *Ovarium* dense adpresse setosum; styli in massam globoso-pyriformem cavam 3-sulcam primum ovarium aequantem connati, apice summo stigmatico brevissime liberi recurvi demum inter cavitatem columnae stylaris plus minusve retracti. *Capsula* 3-cocca, parcius pilosa, 8 mm. lata; cocci subglobosi. *Semina* globosa, brunnea maculis albedo-cinereis notata.

TROPICAL AFRICA. German East Africa: Ukinga; Mt. Kirunde, 2000 m., Goetze, 907. Nyasaland: Masuku Plateau, 2000-2150 m., Whyte, 269.

This *Tragia* is most nearly related to *T. ambigua*, S. Moore in *Journ. Linn. Soc. Bot.*, xl., 202, recently described from specimens collected by Swynnerton in Gazaland. Mr. Moore's species is, however, an unusually widely spread plant in East Africa which was described by Mueller in 1864 (*Flora* xlvii. 435), as *T. mitis* var. *oblongifolia*, and is very doubtfully distinct from *T. natalensis*, Sond. in *Linnaea* xxiii (1850) 107. It resembles a group of species, including *T. tenuifolia*, Benth., *T. laminularis*, Muell.-Arg. and *T. Zenkeri*, Pax, characterised by the presence, on the female calyx segments, of a terminal herbaceous laminula which does not harden as the lobes enlarge during the ripening of the fruit. The styles in the species of this group, which is mainly West African, are united in a slender column for one half their length or less; those of

T. ambigua, however, are connate throughout in a narrow funnel-shaped tube with only the stigmas free. The known Tropical African localities of *T. ambigua* are as follows:—British East Africa: Kibwezi, *Kaessner*, 706. (German East Africa: Rosallo Thal, *Holst*, 3861; Kerematonto, 1700 ft., *Engler*, 3347. Portuguese East Africa: Moramballa, 3500 ft., *Kirk*; Gazaland; Chirinda Forest, 3700–4000 ft., *Swynnerton*, 446, 795. The known South African localities of *T. ambigua*, are:—Cape of Good Hope, *Drège* (*T. involucrata*, *Drège non Jacq.*) Port St. John, 50 ft., *Galpin*, 3462; Natal; Manda, *Gerrard*, 1164; *Wood*, 741. From *T. ambigua*, S. Moore, the species described as *T. anomala* is readily distinguished by its pubescence and differs further from its ally in having the style-column swollen into a pyriform or sub-globose mass quite as large as the ovary when in flower. In this character *T. anomala* therefore agrees with the Madagascar plant described by Baillon (*Étud. Euphorb.*, 466, t. 21) as *Sphaerostylis Tulasneana*. This genus *Sphaerostylis*, which has been doubtfully maintained by Mueller (*DC. Prodr.*, xv., 2, 768) and by Bentham and Hooker (*Gen. Plant.*, iii., 327), as described by Mueller differs from *Tragia* in having a central staminal column, 2-partite stigmas and a globose inflated style-column. As described by Baillon the stigmas are said to be channelled but not said to be 2-partite. The description given of the androecium both by Baillon and by Mueller is such as might apply to that of the androecium of most of the *Tragias* of the group which *T. anomala* resembles, which have extremely short or quite obsolete filaments; Baillon's description and figure of the style-column and stigmas of *Sphaerostylis Tulasneana* accord very closely with the conditions met with in *T. anomala*. It appears probable therefore that *Sphaerostylis Tulasneana* may be only a rather distinct species of *Tragia*.

1337. *Cadalvena Dalzielii*, C. H. Wright [Scitamineae-Zingiberaceae]; a *C. spectabilis*, Fenzl, corollae tubo longiore tenui floribusque minoribus differt.

Rhizoma breve, crassum, carnosum. *Folia* 4, rosulatum disposita, explanata, suborbicularia, ad 10 cm. diametro, utrinque glabra, marginibus membranaceis rubris albo-ciliatis; nervi laterales utrinque 9–14, tenues; venae transversales numerosae, approximatae. *Flores* brevissime spicati; bracteae lanceolatae, 3 cm. longae, 3 mm. latae, pubescentes. *Calyx* spathaceus, breviter 3-dentatus, 3 cm. longus. *Corolla* lutea; tubus 4 cm. longus, tenuis; lobi oblongi, acuminati, 3 cm. longi, 1 cm. lati. *Labellum* luteum, 4 cm. latum, undulatum, infra cuneatum. *Antherae* 5 mm. longae; connectivum oblongum, obtusum, 2 cm. longum, 4 mm. latum. *Ovarium* 6-costatum, pubescens, 3-loculare; ovula plura.

TROPICAL AFRICA. Northern Nigeria: Yola Province; Kilba Country, *Dalziel*, 229. Sokoto and Kontagora Provinces, *Dalziel*, 560.

Hausa name "*takalmin zomo*" (=hare's slipper).

1338. *Testudinaria paniculata*, *Dümmer* [Dioscoreaceae]; affinis *T. sylvaticae*, Kunth, sed inflorescentia majore paniculato-ramosa, perianthiis majoribus rotatis tubo brevior et foliis coriaceis 10–13-nerviis differt.

Planta mascula, robusta, subsempervirens. *Rhizoma* epigaeum, 7·5 cm. altum, irregulariter-oblongum, lignosum, supra complanatum, tessellato-lobatum, fuscum. *Caulis* superne volubilis, ad basin 1·2 cm. diametro, teres vel subcompressiusculus, rigidus, laevis, glaber, viridescens, obscure lenticellatus. *Folia* 2·5–7 cm. longa, 4–11·5 cm. lata, patentia, late reniformia vel breviter deltoideo-subcordata, obsolete triloba, mucronata, 10–13-nervia (raro 9-nervia), utrinque reticulata et nitentia, coriacea, atroviridia, subtus pallidiora, pellucido-maculata, glabra, margine integra, paullo subrecurvata; petioli 1·8–3·7 cm. longi, ascendentes, utrinque complanati, supra paullo sulcati. *Paniculae* axillares, multiflorae, sparse vel copiose ramosae, ramis infimis saepius 6 cm. longis, rachi 5–12·7 cm. longa angulata sparse puberula. *Flores* pedicellati, odorati, subviridescentes vel pallideflavidi, pedicellis 2–4 mm. longis saepe florem abortivum gerentibus uni-vel bibracteolatis; bracteulae 0·7 mm. longae, ovatae, apice acutae, carinatae, membranaceae. *Perianthium* 0·8–1 cm. diametro, rotatum, tubo brevissimo, segmentis enerviis patulis vel subrecurvatis subaequalibus obtusis vel apiculatis. *Stamina* parva, quam perianthii segmenta breviora eorumque basibus affixa. *Ovarii rudimentum* vix conicum, obscure trituberculatum. *Planta feminea* ignota.

SOUTH AFRICA.

The plant upon which the preceding description is based has been cultivated in the Succulent House at Kew under the name of *T. sylvatica*, Kunth, for over 30 years and it was a remark passed by Dr. R. Marloth, whilst on a visit to Kew, which suggested a re-examination of the plant, when its correct status was ascertained. The most salient points of distinction between this and the species with which it has hitherto been confounded lie in the curiously flattened, not dome-shaped, woody rhizome, the coriaceous, subevergreen 10–13-nerved leaves and the larger, short-tubed, rotate flowers, which are moreover disposed in large, axillary panicles.

Although the type specimen of *T. paniculata* came originally from South Africa, it is unfortunate that no record of its introduction to Kew can be discovered nor can anything be said as to its geographical distribution.

1339. *Seychellaria madagascariensis*, C. H. Wright [Triuridaceae]; a *S. Thomassetii*, Hemsl., perianthio florum ♂ 3- (raro 4-) lobato differt.

Rhizoma repens, flexuosum, tenue. *Caulis* erectus, pallidus, 15 cm. altus (inflorescentia inclusa), aphyllus, glaber, squamis paucis distantibus deltoideis acuminatis 3 mm. longis instructus. *Racemus* simplex vel ramosus, circiter 4 cm. longus; bracteae 0·5 mm. longae, membranaceae, acutae; pedicelli 1·5 mm. longi, filiformes. *Flores* ♂ in parte superiore racemi 2–4-nati dispositi. *Perianthium* 2 mm. diametro; lobi 3, raro quarto parvo adjecto, late ovati, glaberrimi. *Stamina* 3; filamenta brevissima; antherae didymae, transverse dehiscentes. *Staminodia* filiformia, staminibus longiora. *Flores* ♀ infra ♂ singulatim dispositi. *Perianthium* 4–5-lobatum, 1·5 mm. diametro; lobi late ovati, glaberrimi, recurvati. *Carpellu*

plura, compresso-ovoidea, 0.74 mm. longa; stylus lateralis, filiformis, ovario triplo longior.

NORTH-EAST MADAGASCAR. *Perrier de la Bâthie*.

Described from a specimen communicated by Prof. H. Jumelle.

1340. *Drake-Brockmania*, *Stapf* [Gramineae-Festuceae]; *Entoplocamiae*, *Stapf*, affinis, et quoad habitum spicularum ei simillima, sed anthoeciis omnibus florigeris, rhachilla fragillima, valvis 5-nerviis, pericarpio haud soluto distincta.

Spiculae lateraliter admodum compressae, mucronatae, sessiles vel subsessiles, in paniculam saepissime capitatim contractam dispositae; rhachilla anfractuosa inter anthoecia fragillima, articulis distinctis. *Anthoecia* circiter 7-8, summo admodum reducto excepto omnia ♂. *Glumae* acuminatae, infra medium late membranaceo-marginatae, caeterum arcte viridi-nervosae, inferior nervis 3-5 (rarius 1), superior nervis 9. *Valvae* mucronatae, latae, albido-membranaceae, eximie utrinque nervis 2 viridibus notatae, in carina a basi ad medium dense ciliatae; callus 0. *Paleae* valvis breviores, curvatae, 2-dentatae, carinatae, carinis alatis ala medio in dentem producta, glabrae. *Lodiculae* 2, minutae, cuneatae. *Stamina* 3. *Ovarium* glabrum; styli ima basi connati, capillares, longiusculae; stigmata tenuia, plumosa, sub apice anthoecii breviter exserta. *Caryopsis* valva paleaque inclusa et cum iis decidua, a latere subcompressa; pericarpium tenue, adnatum. *Embryo* ad medium caryopsis attingens, prominens, scutello ima basi a coleorrhiza libera, epiblasto distincto obtuso.—*Gramen* annuum, a basi ramosum, ramis brevissimis vel elongatis et tunc geniculato-adscendentibus et iterum ramosis, foliis mollibus.

D. somalensis, *Stapf*. *Species unica*.

Gramen ad 12 cm. altum. *Culmi* teretes, glabri, laeves, internodiis exsertis. *Foliorum* vaginae inferiores laxae, basin versus latae, omnes saltem inferne hirsutae pilis tenuibus tuberculo insidentibus; ligulae membranaceae, breves, truncatae, denticulatae; laminae molliter herbaceae, lineares vel lanceolatae, longe sursum attenuatae, acutae, 1-6 cm. longae, 1-3 mm. latae, virides, multinervosae, inferne hirsutae. *Paniculae* capituliformes, 1-1.5 vel fere 2 cm. longae lataeque, foliis saepe superatae; rhachis tenuis, tenax, glabra; rami pauci, breves, magis minusve compressae. *Spiculae* ambitu late ovatae, 6-7 mm. longae lataeque, albae, viridi-variegatae. *Glumae* subaequilongae, lanceolatae, acuminatae, 6-7 mm. longae, praeter margines inferiores virides, persistentes. *Valvae* a latere visae late oblique ovatae, 3-4 mm. longae, ad carinam et prope margines infimas molliter ciliatae, nervis lateralibus a carina remotis. *Paleae* glabrae. *Lodiculae* 0.3-0.4 mm. longae. *Antherae* ellipticae, 0.65-0.75 mm. longae, stigmatibus adhaerentes et cum iis exsertae; filamenta capillaria. *Styli* ad 1 mm. (vel ultra) longae; stigmata ad 1.5 mm. longa, angusta. *Caryopsis* olivaceo-grisea vel humefacta brunnea, paulo 1 mm. excedens.

BRITISH SOMALILAND. Bulhar, *Drake-Brockman*, 616, 617, 646, 647.

XXI.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII
CONSERVATARUM.

DECAS LXV.

641. *Hibiscus Watsoni*, *W. W. Smith* [Malvaceae-Hibisceae] ex affinitate *H. cancellati*, Roxb., a quo spicis floriferis multibracteatis exinie congestis et petalis angustioribus differt.

Frutex 1-1.5 m. altus, erectus vix ramosus; caulis infra lignosus ad hastilia conficienda ab incolis adhibitus, supra fistulosus, pallidus, spiculis multis hispidis ornatus, tandem in spicam aliquando 30 cm. longam et 10 cm. diametro densissime floribus confertis et bracteis linearibus onustam desinens. *Folia* orbicularia, cordata, sinuata vel breviter lobata, apice at lobis acuta, basi profunde (ad 5 cm.) fissa, rugosa, utrinque plus minusve hispida praecipue ad nervos in junioribus, marginibus ob nervos et reticulationem productos laciniatis, 20-25 cm. longa et lata; costae 5, prominentes, media et intermediae angulo 50° ortae, nervis utrinque 3-4 munita exteriores deflexae nervis utrinque circa 5; nervuli transversi multi prominentes, ut reticulatio; petiolus crassus. *Spica* terminalis, multiflora; flores bracteis permultis linearibus sericeis etiam hispido-glandulosis 6-7 cm. longis suffulti; involucrium tubulosum, sericeum, 10-13-lobum, tubo 1 cm. longo, lobis longe acuminatis inaequalibus 2 cm. longis. *Calyx* subspathaceus, coriaceus, sericeus, striatus, in lobos 5 irregulariter fissus, 3-4 cm. longus, basi intus pilis multis albis villosus. *Corolla* flava, basi tubulosa, tubo stamineo adnata; lobi obovati, cuneati, apice rotundati, acutati vel emarginati, 3-3.5 cm. longi, ad 1 cm. lati. *Stamina* in columnam 3-4 cm. longam connata; filamentella brevia; antherae reniformes, crassae, tandem late dehiscentes; pollinis granulae magnae, globosae, spinosae. *Ovarium* villosum; styli 4-5, breves, connati, supra ad 2-3 cm. soluti, villosi, stigmatibus capitatis complanatis. *Capsula* ovata, dense sericeo-villosa, acuminata, 3 cm. alta, 1.5 cm. diametro. *Semina* in quoque loculo circa 3-4, reniformia, villosa, 5 mm. longa; testa coriacea; cotyledones oblongi, 3.5 mm. longi; radícula cylindrica, 2.5 mm. longa.

SOUTHERN SHAN STATES. At Taunggyi, about 1000 m. *H. W. A. Watson*, 2061; near Pinlaung, 1200-1500 m. on rocky soil Moung Thaw Forest, *W. A. Robertson*, 94.

642. *Paradombeya multiflora*, *Gamble* [Sterculiaceae]; a *P. burmanica*, Stapf, foliis longioribus, florum fasciculis axillaribus plurifloris et petalis minoribus praecipue differt.

Arbuseula vel arbor parva, ad 3 m. alta, ramulis teretibus fuscis linea pallida glabra infra nodos latiuscula munitis. *Folia* longissime lanceolata, membranacea, serrata, apice longe acuminata, basi attenuata; 12-20 cm. longa, 3-4.5 cm. lata; utrinque in parenchymate et ad nervos et costam pilis bulbiferis parce setulosa, ad costam etiam supra crispo-puberula; nervi utrinque 8-10 quorum par infimum e basi ortum; nervuli transversi pauci sed conspicui, irregulares; petiolus 0.8-1 cm. longus, crispo-puberulus. *Flores* in racemis axillaribus fasciculatis permulti, capitulum globosum 2 cm. latam formantes; racemi 5-7 mm. longi; pedicelli gracillimi,

3-5 mm. longi, bracteolis 3 lanceolatis seu linearibus. *Calycis* segmenta oblongo-lanceolata, 4-5 mm. longa, reticulata et receptaculis subcutaneis mucilagine repletis munita. *Petala* late et inaequaliter obovata, truncata, 5 mm. longa, apice 4 mm. lata. *Stamina* perfecta 15, cum staminodiis 5 in annulum coalita; filamenta gracilia, inaequalia, aliquando per paria unita; antherae ovatae, connectivo incrassato junctae; staminodia linearia, mucilaginea, 4-5 mm. longa. *Ovarium* 5-loculare, dense stellatim albo-tomentosum; stylus subclavatus, 4-5 mm. longus. *Capsulae* loculi 5, globosi, dense stellatim albo-tomentosi, introrsum loculicide dehiscences, 2-3 mm. diametro, pericarpio tenuiter crustaceo. *Semina* in quoque loculo 2 perfecta, ellipsoidea; testa coriacea; albumen copiosum; cotyledones plicatae.

SOUTHERN SHAN STATES. At Loi Ai: near Sukat Kyaukdwin, in scrub forest and old clearings, 760 m., *W. A. Robertson*, 65, Dec. 1909.

643. *Elaeocarpus Robertsoni*, *Gamble* [Tiliaceae]; *E. petiolato*, Wall., affinis, foliis minus coriaceis, ovario villosio triloculari (nec glabro biloculari) et antheris brevissime et obtuse apiculatis (nec aristatis) praecipue differt.

Arbor ad 12 m. alta, ramulis griseo-brunneis, ultimis glabris. *Folia* chartacea, ovata, apice obtuse acuminata, basi rotundata; margine inconspicue crenata vel subintegra; utrinque siccitate glabra, olivacea, supra vix lucida; 10-12 cm. longa, 4-6 cm. lata; nervi utrinque 8-10, pallidi, ramosi, ramis in glandulas crenaturarum desinentes; reticulatio conspicua; petiolus 2.5-4 cm. longus, glaber, supra sulcatus. *Racemi* axillares, glabri, pauciflori, floribus ad 15 sparsis saepissime recurvis; rhachis angulatus, sulcatus; pedicelli circa 1 cm. longi. *Calycis* lobi 5, lanceolati, 7-8 mm. longi, acuminati, margine incurvo excepto glabri, costa intus prominente. *Petala* 5, oblonga, 8-9 mm. longa, apice fimbriata, dentibus circa 9 1.5-2 mm. longis, basi ad dimidiam partem incurva, extus sericeo-villosa, intus etiam pilis decurvis villosa et incrassata, ad basim ob glandulas discoideas excavata. *Discus* carnosulus, lobis 10 subglobosis, glabris. *Stamina* circa 20-24, linearia, puberula, 5 mm. longa, antheris apice in mucronem brevem obtusum desinentibus, filamentis antheris dimidio brevioribus. *Ovarium* ovoideum, triloculare dense albo-villosum; stylus ultra stamina paullo elongatus, parce villosus. *Drupa* ignota.

SOUTHERN SHAN STATES. At Kalaw, near water, 1310 m., *W. A. Robertson*, 149, April 1910.

644. *Lespedeza sessilifolia*, *Gamble* [Leguminosae-Hedysareae]; species foliis sessilibus insignis, aliis notis ad *L. eriocarpam*, DC. accedit.

Arbuscula ramulis virgatis angulatis albo-sericeis ultimis quadrangulis. *Folia* chartacea, trifoliata, sessilia vel petiolo vix 3 mm. longo; foliola elliptica vel elliptico-obovata, apice mucronata, apice et basi rotundata, medium ad 5 cm. longum, 2.5 cm. latum petiolulo 7 mm. longo, lateralia minora petiolulis vix 2 mm. longis; supra glabra pallida, infra adpresse sericeo-villosa; nervis utrinque 8-10 prope marginem arcuate junctis et reticulatione prominenter areolata; stipulae subulatae, petiolo longiores. *Racemi* axillares, graciles,

ad 8–10 cm. longi; rhachis albo-sericea; bractee subulatae, 2 mm. longae; pedicelli filiformes, 5 mm. longi. *Calyx* campanulatus, extus sericeus, 3–4 mm. longus, fere ad basin fissus, lobis 2 superioribus ad dimidiam partem junctis. *Corolla* purpurea, ad 1 cm. longa; vexillum obovatum; alae oblongo-obovatae, stipitatae, auriculo prope basin rotundato; carina in angulum rectum curvata, acuminata. *Stamina* petalis longiora, antheris minutis. *Ovarium* dense sericeum, stylo longo filiformi curvato. *Legumen* obovatum, apiculatum, dense sericeo-villosum, 7 mm. longum, 4 mm. latum.

SOUTHERN SHAN STATES. On bare hills at Paktu Mong, 1220 m., *W. A. Robertson*, 54, Dec. 1909.

645. *Beilschmiedia Robertsoni*, *Gamble* [Lauraceae]; quoad inflorescentia *B. Bourdillonii*, Brandis, affinis sed foliis differt. Differt etiam a *B. assamica*, Meisn., foliis et ramulis conspicue pubescentibus et ovario villosis.

Arbor elata, ad 30 m. alta, ramulis subcrassis griseis ultimis pubescentibus; alabastra florifera conspicue perulata, foliifera parva, ovoidea, fusco-pubescentia. *Folia* submembranacea, alterna vel subopposita; elliptico-obovata vel oblanceolata, apice acuminata, basi attenuata; supra glabra nitida, infra puberula, praecipue ad costam et nervos; 9–18 cm. longa, 4–7 cm. lata; costa supra prominens glabra, infra prominens pubescens; nervi utrinque 8–10, irregulares, ramosi; reticulatio prominenter areolata; petiolus circa 2 cm. longus, pubescens. *Cymae* axillares fasciculatae, conspicue perulis suborbicularibus extus griseo-pubescentibus intus glabris suffultae; bracteolis oblongis 3 mm. longis. *Perianthii* tubus brevis; lobi oblongi, obtusi, ad 3 mm. longi, pubescentes. *Stamina* ordinis I et II 2–3 mm. longa, filamentis latis pubescentibus; ordinis III 2 mm. longa, glandulis 2 magnis glabris ad basim munita; staminodia ordinis IV cordata glabra, filamentis brevibus pubescentibus, 1 mm. alta, 1.5 mm. lata. *Ovarium* ovoideo-oblongum dense villosum, stylo glabro, stigmate recurvo. *Fructus* ignotus.

SOUTHERN SHAN STATES. In moist forest at Hlwegyi, 610 m., *W. A. Robertson*, 105, Jan. 1910.

646. *Wilkstroemia Ridleyi*, *Gamble* [Thymelaeaceae-Euthymelaeaceae]; species *W. Candolleanae*, Meisn., affinis, foliis majoribus membranaceis, inflorescentia terminali differt.

Arbuscula, ramulis gracilibus fuscis teretibus ultimis puberulis. *Folia* opposita, membranacea; lanceolata, apice obtuse acuta vel acuminata, basi acuta vel paullo rotundata; utrinque glabra, olivacea, lucida; 5–13 cm. longa, 2.5–4.5 cm. lata; costa gracilis, nervi utrinque 8–10 obscuri, irregulares, obliqui, nervis paucis secundariis additis; reticulatio obscura; petiolus brevissimus, 2–3 mm. longus. *Flores* flavi, in fasciculis 5–6-floris terminalibus, pedunculis circa 5 mm. longis, pedicellis brevissimis pubescentibus. *Perianthii* tubus gracilis, elongatus, glaber, ad 1 cm. longus; lobi ovati, subaequales, 4 mm. longi. *Stamina* infra tubi faucem inserta, 4 superiores a 4 inferioribus 2–3 mm. distantes, filamentis brevissimis, antheris oblongis 1.5 mm. longis. *Discus* hypogynus lobis 4 linearibus per paria junctis hyalinis 1–2 mm. longis. *Ovarium* obovoideum, apice hirsutum, stylo gracili, stigmate magno papilloso.

Drupa 6-7 mm. longa, 5 mm. diametro, pericarpio carnoso rubro. *Semen* drupae conforme; testa exterior crustacea, interior membranacea; cotyledones carnosae.

MALAY PENINSULA. Tringganu: at Pulo Katan, *Ridley*. Pahang: at Pekan and Kwala Brawas, *Ridley*, 1583 &c. (all in Herb. Singap.).

647. *Henslowia monticola*, *Gamble* [Santalaceae-Osyrideae]; species *H. granulatae*, Hook. f. et Thom., affinis, differt ramulis non pustulatis glabris, drupa parva globosa, pedicello gracili. Affinis etiam *H. buxifoliae*, Blume, foliis sulcatis praecipue differt.

Frutex parasiticus, ramulis laevibus angulatis nigrescentibus. *Folia* coriacea, glabra, siccitate nigrescentia, obovato-spathulata, apice obtusa et emarginata, basi in petiolum gracilem 5 mm. longum acuminata, marginibus recurvis; 2-3 cm. longa, 1.5-2.5 cm. lata; costae 3, laterales 2 pedatim divisae ut 5 essent, exteriores 4 late curvatae ad apicem, omnes in sulcis conspicuis sitae; nervi pauci, breves; nervuli transversae ut reticulatio obscurae. *Flores* in racemorum fasciculis brevissimis axillaribus vel lateralibus; racemi pauciflori, 3-5 mm. longi; bracteae 0 vel cito deciduae. *Perianthii* tubus ovarium cingens; lobi triangulares, acuti, 0.5-1 mm. longi, fructu persistentes. *Discus* concavus, 1-2 mm. latus. *Stigma* centrale 5-lobum. *Drupa* nigrescens, globosa, 3 mm. diametro, obscure sulcata; exocarpio carnoso, endocarpio rugoso angulis multis in albumen porrectis; cotyledones radicae breviores.

MALAY PENINSULA. Perak: camp on Ulu Batang Padang, 1500 m., *Wray*.

648. *Henslowia Ridleyi*, *Gamble* [Santalaceae-Osyrideae]; species *H. Lobbianae*, A. DC., affinis, foliis majoribus orbiculatis, racemis longioribus et drupa magna insignis.

Frutex scandens, parasiticus (?), ramulis crassis siccitate nigrescentibus. *Folia* coriacea, late obovata vel orbiculata, apice rotundata et aliquando paullo emarginata, basi abrupte in petiolum attenuata; supra et infra glabra, supra lucida, infra ferruginea, aliquando punctulata; margine paullo recurva; 2-5.5 cm. diametro; costae primo 3, laterales 2 pedatim in 2 divisae, omnes curvatae et apicem versus arcuatum junctae; nervi nulli; nervuli transversae cum reticulatione obscurae; petiolum 1-2 cm. longum, infra subgracilis. *Flores* pro genere magnae, in racemis paucifloris ad 2 cm. longis in axillis foliorum fasciculatis; bracteae parvae, deciduae. *Perianthii* tubus in ♂ brevissimus, lobis 5-6 triangularibus, 1.5 m. longis, in ♀ ovarium amplectens, lobis paullo quam in ♂ brevioribus persistentibus. *Discus* concavus, in ♂ medio solum apiculatus, in ♀ stigma lobatum circumdans. *Drupa* magna, obovoidea, circa 1.3 cm. longa, 9 mm. diametro, exocarpio tenui, endocarpio sulcato rugoso angulis multis intus in albumen porrectis.

MALAY PENINSULA. Selangor: at Sempang mines, *Ridley*, 15,568. Pahang: at Kluang Terbang, *Barnes*; at Gunong Tahan, 1500-1800 m., *Wray* and *Robinson*, 5484 (?)

649. *Henslowia Wrayi*, *King* MS. in Herb. Calc. [Santalaceae-Osyrideae]; species *H. Lobbianae* A. DC., affinis, drupa ellipsoideo-obovoidea 1 cm. longa (nec globosa) praecipue differt.

Frutex scandens, parasiticus, aliquando 12-18 m. attingens, ramulis teretibus gracilibus. *Folia* coriacea, glabra, siccitate

olivacea, elliptico-obovata vel-oblanceolata, interdum orbiculata, apice obtuse acuta vel rotundata, basi acuta vel acuminata, marginibus recurvis; 4-8 cm. longa, 2-5 cm. lata; costae 3 prominentes, raro ramosae; nervi pauci, breves, inconspicui, praecipue ad latera; reticulatio obscura; petiolus crassus, circa 5 mm. longus, in laminam gradatim expansus. *Flores* in fasciculis brevibus racemorum ex foliorum vel foliorum delapsorum axillis; racemi ♂ graciles, 3-4-flori, 5-7 mm. longi, bracteis parvis ovatis ad rhachin et infra flores sitis; racemi ♀ crassiores, pauciflori pedicellis vix 1 mm. longis. *Perianthii* tubus in ♂ brevissimus, lobis triangularibus 0.5-7 mm. longis apice uncinatis; in ♀ ovarium cingens, quoad lobos sicut in ♂. *Discus* concavus, 1 mm. latus, in ♂ minute apiculatus, in ♀ cum stigmate 5-lobus. *Drupa* ellipsoideo-obovoidea, 1 cm. longa, 7.5 mm. lata, non sulcata, endocarpio rugoso; albumen multilobatum.

MALAY PENINSULA. Perak: in hilly country, 150-300 m., *King's Collector*, 4214, 10,834; at Sungie Larut and Relan Tujor, *Wray*, 2279, 4032. Malacca, *Goodenough*, 1937; *Hervey*.

650. *Scleropyrum Ridleyi*, *Gamble* [Santalaceae-Osyrideae]; species *S. Maingayi*, Hook. f., affinis, foliis infra molliter tomentosis et drupa dimidio minore differt.

Arbor parva, ad truncum spinis rectis acutis 1-2.5 cm. longis armata; ramuli crassi, etiam spinosi, ultimi molliter ferrugineo-tomentosi sicut innovationes, inflorescentia et folia omnia vetustioribus exceptis. *Folia* submembranacea, variabilia, ovata, obovata vel oblongo-lanceolata, apice acuta vel (interdum abrupte) acuminata, basi acuta vel rotundata et saepe inaequalia; supra pallida paullo bullata, infra pallida, tomentosa; 10-25 cm. longa, 5-10 cm. lata; costa prominens, supra impressa; nervi utrinque 6-10, irregulares, infra prominentes, ad marginem curvati; nervuli transversii irregulares ut reticulatio; petiolus 0.3-1 cm. longus, supra sulcatus. *Flores* ♂ in spicis dense rufo-pubescentibus 7-8 cm. longis, rhachi crasso, perianthii tubo crasso 5 mm. longo; ♀ in spicis 15-25 cm. longis, rhachi dense pubescente, perianthii tubo cylindrico rufo-tomentoso 2-3 mm. longo; lobi ovati reflexi, 2-3 mm. longi. *Stamina* brevissima, filamentis crassis, antherarum thecis brevissimis. *Discus* 5-lobus. *Ovarium* pubescens, stylo crasso, stigmate capitato lobato, lobis reflexis. *Drupa* pyriformis, 3-4 cm. longa, 1-1.5 cm. diametro, exocarpio fere glabro, endocarpio osseo rugoso; rhachis fructifera aucta. *Semen* 1 cm. diametro, cotyledonibus tenuibus oblongis.

MALAY PENINSULA. Singapore: at Selitar and other places, *Ridley*, 1921, 4761, 5889; at Changi, *Hullett*, 850.

XXII.—MISCELLANEOUS NOTES.

Portrait of the late Sir J. D. Hooker.—To Mr. C. P. Hooker, Dollarward House, Cirencester, Kew is deeply indebted for the gift of a photogravure reproduction of a portrait of his father, the late Sir J. D. Hooker, as a young man. The original, a crayon drawing by the late G. Richmond, R.A., was executed in November, 1855, and is a companion picture to a similar portrait of the late Dr. T. Thomson, the companion of Sir Joseph during the later portion of

the travels described in the famous *Himalayan Journals*. The two friends returned to England in 1851 and during the next three years were conjointly engaged in the preparation of their *Flora Indica* the first and only volume of which was issued in 1855. The portraits mark the close of this period of companionship and collaboration. That of Thomson was presented to Kew by Sir Joseph many years ago and it is pleasant to reflect not only that Kew now possesses a vivid likeness of the brilliant author of the *Himalayan Journals* but that portraits of the joint authors of the *Flora Indica* hang side by side in the building in which their work was done.

Presentation of Chinese Drawings.—Under the will of the late Mrs. Mary Anne Robb (Miss Boulton of Tew Park, Oxon) a very interesting collection of twenty-three drawings in water colour of Chinese Conifers has been received at Kew for the Museums. These drawings were executed by a native Chinese artist who was engaged by the celebrated traveller Robert Fortune during his last journey at the request of Mrs. Robb as she wished to have sketches of the new trees, found by Fortune, drawn on the spot. The artist stipulated that he would only make pictures if allowed to put a human figure in each.

Mrs. Robb, who was descended from Mathew Boulton, the engineer and partner of James Watt, was possessed of great intellectual gifts and wide interests.

Among her more intimate friends were Francis Galton and the Hon. Charles Ellis. She took a keen interest in gardening and at her garden called Golden Field at Liphook she indulged in the cultivation of flowering shrubs which was one of her hobbies, the old cultivated forms of the Damask Rose being among her favourites. She often visited the Royal Botanic Gardens and corresponded frequently with Kew on horticultural matters.

The drawings are detailed in the list appended. One of them, no. 21 representing the Maidenhair tree, *Ginkgo biloba* (*Salisburia adiantifolia*) is already well known to botanists as it has been reproduced to form a plate for the paper on the Maidenhair tree written by Prof. A. C. Seward and published in the *Annals of Botany*, vol. xiv., 1900, p. 110, Pl. viii.

	Ft.
1. "Tsung le shu" (Hemp Palm) <i>Chamaerops</i> sp.	15-20
2. "Peen pih shoo," <i>Thuya</i> sp.	60
3. "Sung shoo," <i>Pinus sinensis</i>	130
4. "Lo sung shoo," <i>Podocarpus</i> sp.	80
5. "Shuy pih shoo," <i>Cephalotaxus Fortunei</i> ...	30
6. "Kin tseen sung" (Golden Coin pine), <i>Larix</i> sp.	70
7. "Water Pine,"	60
8. "Lan pan shu," <i>Juniperus</i> sp.	20-30
9. "Nyun par shu," <i>Juniperus</i> sp.	60-70
10. <i>Cupressus funebris</i>	70
11. "Kin tsien sung shu" (Golden Coin pine) <i>Abies</i> <i>Kaempferi</i>	100
12. "Yung ching pah shu," <i>Juniperus</i> sp.	20

		Ft.
13.	"Pem pah shu," <i>Thuya</i> sp.	20-30
14.	"Maou chuh," "This is the finest Bamboo in China and is prized above all others, owing to the clean branched stems it produces. Young shoots eaten by the Chinese" ...	70
15.	"Mein pah shu" (Prostrate Juniper) <i>Juniperus</i> sp.	1-2
16.	"Tsye sung pah shu," <i>Thuya</i> sp.	10-15
17.	"Kin sung shu," <i>Pinus</i> sp. Japan, only found in gardens in China	30
18.	"Pa be sung shu" (White barked pine)	50
19.	"Lew san shoo" <i>Cryptomeria japonica</i>	100
20.	"Peh shoo," <i>Juniperus sphaerica</i>	60
21.	"Pih kwo shu" <i>Salisburia adiantifolia</i>	
22.	"Tsye san shoo," <i>Cunninghamia sinensis</i>	50
23.	"Lo tung," <i>Abies jezoensis</i>	

Agave atrovirens.—A large and extremely fine specimen of *Agave atrovirens* has been a conspicuous object in the Succulent House at Kew for many years. Early in March of the present year it showed signs of flowering, the upper leaves that were formed being much smaller and less spinous than ordinary leaves. The inflorescence or "pole" soon made its appearance and elongating rapidly, reached the roof in the course of three weeks. It then became necessary to move the plant into the open air and this entailed the removal of the greater part of the end of the building. No sooner had the plant been taken to a place on the lawn adjoining the south end of House No. 5 than the weather changed; cold winds from the north and east accompanied by frosty nights continued for over a fortnight. The growth of the plant was checked considerably, without however causing it any apparent injury. The flower spike has continued to elongate and is now some 18 feet high. The plant has exactly 60 leaves, the longest of which is 7 feet 3 inches, 9½ inches broad in the middle and 14½ inches at the base. Some of the lower leaves are 11 inches thick in the middle and 15 inches at the base, but only 4 to 5 feet in length.

The history of this specimen has, unfortunately, been lost, it is certain however that it was not in the collection in 1856 as it is not included in the list of Agaves compiled by J. Smith in his "Records of Kew." Mr. N. E. Brown, who came to Kew in 1873, says the plant was in the collection at that date and was then some 5-6 feet in diameter.

The name must be accepted with some reserve until the flowers appear as it differs in several respects from the wild specimens and from the original description of this species published in *Hortus Dyckensis*, p. 302.

C.P.R.

Kew Palace Linden.—A link with the past when Kew was a Royal domain disappears by the removal of this ancient specimen of Linden or Common Lime, *Tilia vulgaris*, Hayne. Growing on a

mound to the left of the entrance gates to Kew Palace from the riverside, the tree was described when in its prime, as a good specimen of singular beauty and great height. The girth of the trunk at 4 feet from the ground was 18 feet 7 inches. The tree is said to have been a favourite haunt with the children of George III when "pursuing their youthful studies." (*K.B.*, 1891, p. 318.) It is perhaps for this reason that in some books the tree is referred to as the "King's Lime." During a heavy storm on January 27, 1901, the tree suffered severely, all that remained was about 9 feet of the trunk. (*K.B.*, 1901, p. 86.) Being of historic interest the portion remaining was made to look presentable with the aid of a few bricks and cement. As evidence of the life left in the old tree two or three vigorous young shoots developed. It was one of these growths, coupled with the attack of fungus and decay of the heart-wood, which finally broke up the trunk. A strong wind during March of this year blew off one of the strongest growths, this unfortunately taking with it at least one-third of the trunk. As the tree was thereby reduced to a complete wreck the remains were cleared away on April 3 and burned.

A.O.

The Cricket-bat Willow.—A paper published in the *Kew Bulletin*, 1907, p. 311, dealt with the identity of the forms of *Salix* whose timbers are most prized by cricket-bat makers. It was there shown that the best of all willows for bat-making is a pyramidal-growing, female form of the blue willow (*Salix alba* var. *coerulea*), which, except for recent plantings, is only found in a few East Anglian counties. There was one interesting and important question which, for want of data, could not then be decided, this was whether restriction of the best cricket-bat willow to these eastern counties was due to its being a local variety, or perhaps hybrid, possessing by inheritance those peculiar qualities the cricket-bat maker desires; or, whether those qualities were due to, and dependent on, local conditions of climate or soil. As is well known the East Anglian climate is the driest and sunniest in the United Kingdom, and it was by no means certain in the opinion of several competent observers that the timber of the cricket-bat willow would retain its peculiar value if it were produced, say, in the warm, humid climate of Cornwall or in the somewhat similar conditions of the west of Scotland. Large numbers of cricket-bat willows have been planted during the past five years and it has become important to ascertain how far the labour and expense incurred in such districts is likely to be recompensed.

Through the kindness of Mr. J. Arthur Campbell we are able to give an encouraging report on some timber of cricket-bat willow grown on his estate at Arduaine, Lochgilphead, Argyllshire. Mr. Campbell, for experimental purposes, made a plantation there of about 150 trees in 1903 and 1904. One of these, planted in 1904, having attained a diameter in its trunk of 6 to 7 inches he cut down and sent to Mr. D. J. Carter, willow dealer of Newtown, Waltham Cross, Herts, to ascertain its suitability and value for bat-making. Mr. Carter reported that it was perfectly satisfactory

and if of proper size for cricket-bat making (48 inches in circumference would have fetched the normal price per cubic foot. This timber, having been grown under a rainfall of about 60 inches per annum as compared with that of East Anglia, which is under 25 inches, appears to afford sufficient proof that its peculiar virtues are inherent and not necessarily dependent on its environment.

It need hardly be said that cutting down trees of the size of the one noted above is wasteful. So much greater is the proportion of woody tissue deposited on the trunk as the tree increases in size that, even allowing for compound interest, a loss is incurred by felling trees before they are $1\frac{1}{2}$ to 2 feet in diameter of trunk.

In the article on this willow in the *Kew Bulletin* of 1907, it was suggested that its qualities were probably due to its remarkable vigour of growth. Whether this be so or not, there is no doubt that the timber of rapidly grown trees is better for the bat maker's purpose, and of greater value per cubic foot, than that of slowly grown, comparatively stunted trees which is contrary to what obtains with timbers in general. The best bat maker's timber is that in which the annual rings are not less than $\frac{1}{2}$ inch wide. Trees on poor or comparatively dry ground will bring in neither so quick nor so large a return per cubic foot of timber as those grown on better, moister soil. This is a matter that should receive attention when a site is selected; further, any attention to the welfare of young trees will be repaid. Mr. Campbell believes that manuring the roots will prove profitable.

W. J. B.

Dendrobium Imthurnii.—In the description given of this new orchid in *K.B.*, 1912, p. 131, it was stated in error that its habitat was the Solomon Islands. We are informed by Sir Everard im Thurn that it was found near the Erakor Lagoon, Efate Island, New Hebrides.

Botanical Magazine for April.—The plants figured are *Schomburgkia Lueddemani*, Prill. (t. 8427); *Magnolia Kobus*, DC. (t. 8422); *Agave protuberans*, Engelm. (t. 8429); *Daphne retusa*, Hemsl. (t. 8430) and *Campanula arvensis*, Lag. (t. 8431).

Schomburgkia Lueddemani is closely allied to *S. undulata*, Lindl., but differs in the colour of the flowers and especially in the bright yellow patch on the lip. The plant is of interest since it has been lost sight of since 1862, when it was described by M. Prilleux from a plant in the collection of M. Lueddeman in Paris. The plant figured was purchased for Kew from the collection of the Hon. W. Rothschild, Tring Park, and is reported to have come from Venezuela.

The *Magnolia* is a Japanese species and in its native country attains a height of over 70 feet and in this respect differs from its nearest allies *M. stellata*, Maxim. and *M. salicifolia*, Maxim., which are shrubby plants. The flowers are not very large. The species is known in two varieties and the one figured is a small growing tree and flowers freely; it was introduced to England about 1879 by Maries when collecting for Messrs. J. Veitch & Sons.

Agave protuberans differs from the true *Agaves* and from the *Littaeas* in having the flowers solitary on simple racemes or spikes and in having herbaceous leaves without a terminal spine. It belongs to the *Manfredas*, of which its near ally *A. virginica*, Linn., is a representative, and which may be regarded as a sub-genus of *Agave*. The leaves are covered with brownish-purple spots or blotches. The plant inhabits the mountains near San Luis Potosi, Mexico, at altitudes from 6000 to 8000 feet. The material for the figure was supplied by Mr. R. H. Beamish, Glounthane, near Cork and by Mr. H. J. Elwes, Colesborne.

The interesting *Daphne* was discovered by Mr. A. E. Pratt near Tchien-lu, W. Szechuan, between 9000 and 13,000 feet in 1889. Mr. Wilson collected it in 1903 in the same locality and from the material sent home to Messrs. J. Veitch & Sons at Coombe Wood the subject of the illustration has been derived. The pink flowers are produced in early May with the new leaves and are pleasantly fragrant.

Northern Spain is the home of the pretty little *Campanula* which forms the concluding subject of this number of the magazine. Though described in 1805 it was lost sight of and was re-discovered and again described as *C. acutangula* by Leresche and Levier in 1879. It appears to be most closely allied to the Tirolese *C. morettiana*, Reichb., but differs in being glabrous and in its smaller leaves and more broadly open flowers. The plant was purchased for the Kew collections from Mr. H. Correvon, Geneva.

Industrial Alcohol.—We are indebted to Mr. J. G. M'Intosh for pointing out that his book on this subject was omitted from the bibliography at the end of Mr. Holland's article on Alcohol in *K. B.*, No. 3, 1912, pp. 113-130. We regret this inadvertent omission and take this opportunity of giving some further references to works and papers which contain useful information on the subject.

Addenda to bibliography of works relating to the production of Alcohol, *K. B.*, No. 3, 1912, p. 130.

- Barral, James, & Co., "Beetroot Distillation," pp. 1-126 (A. Schultze, London, 1870); including a "Report on the Subject by Dr. Augustus Voelcker, F.R.S.," pp. 19-49.
- Harden, Dr. A. "Alcoholic Fermentation," pp. 1-128 (Longmans, Green & Co., London, 1911).
- D'Hérèlle, F. H., "Utilisation des Résidus de la Défibration des Agaves pour la Production de L'Alcool," in *Journ. D'Agric. Tropicale*, x., 1910, pp. 161-167.
- Herrick, R. F., "Denatured or Industrial Alcohol," pp. 1-516 (John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1907).
- Hough, W., "The Pulque of Mexico," in *Proc. U.S. National Museum*, xxxiii. 1908, pp. 577-592, figs. 1-19.
- M'Intosh, J. G., "Industrial Alcohol: A Practical Manual on the Production and Use of Alcohol for Industrial Purposes and for Use as a Heating Agent, as an Illuminant and as a Source of Motive Power," pp. 1-250, with 75 Illustrations and 25 Tables (Scott, Greenwood & Son, London, 1907).

- Malpeaux, L., "La Betterave de Distillerie et la Betterave Fourragère," pp. 1-194, figs. 1-15 (Masson & Co., Paris).
- Perkins, A. J., "Report on the Amount of Spirits that may be extracted from a Ton of Raisins," in *Journ. Agric. S. Australia*, xiii., 1909, pp. 192-198.
- Pharmaceutical Journal*, xx., 1905, "Alcohol for Industrial Purposes," pp. 590-591; pp. 621-623.
- Voelcker, Dr. A., "On the Cultivation and Uses of Sugar-beet in England," in *Journ. Soc. Arts*, xix., 1871, pp. 307-318, including "Beet-root Distillation," pp. 314-316.
- Voelcker, Dr. A., "On Sugar-beets and Beet-root Distillation," in *Journ. Roy. Agric. Soc.*, vii., 1871, pp. 60-85.
- Wright, F. B., "A Practical Handbook on the Distillation of Alcohol from Farm Products and the Denaturing of Alcohol," pp. 1-194, figs. 1-33 (Spon & Chamberlain, New York: E. & F. N. Spon, Ltd., London, 1906).

St. Kitts Sugar Factory.—We learn with interest from the *Agricultural News*, vol. xi., no. 259 (March 30th), p. 99, that the new Central Sugar Factory in St. Kitts was formally opened on February 20th, 1912, in the presence of the Administrator of St. Kitts, His Honour T. L. Roxburgh, C.M.G., the Imperial Commissioner of Agriculture, Dr. F. Watts, C.M.G., and many others.

The Central Sugar Factory at Gunthorpes, Antigua, opened in 1904, which was established largely owing to the energy and foresight of Dr. Watts, has fully justified the expectations of its promoters and the formation of the factory in St. Kitts is the result of its uninterrupted career of successful operation. There seems every reason to anticipate that the new factory will add materially to the prosperity of the Presidency of St. Kitts-Nevis.

The following particulars are taken from Mr. Tempany's account in the *Agricultural News* :—

The factory "is situated in the Basseterre valley, about 1 mile from the town, and its cane supply is at present derived from the estates situated in the valley adjoining it, and on the leeward coast of the island. It is contemplated that during coming years the operations of the factory will be extended to include a considerable number of the estates on the windward side of the island. The plant is of modern design, Messrs. Mirrlees, Watson & Co., Ltd., of Glasgow, being responsible for its construction.

"The mill is of the fourteen-roller pattern, comprising a Krajewski crusher and a train of four three-roller mills. It is estimated that the factory is at present capable of producing 8000 tons of grey crystal sugar, but provision is made for further extension to 10,000 to 12,000 tons, as its maximum output."

As Mr. Tempany justly observes "The event must rank as one of the first importance in the history of the Leeward Island Colony, marking as it does a further step in the transition from old-fashioned methods of sugar manufacture to those that are modern and economical."



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